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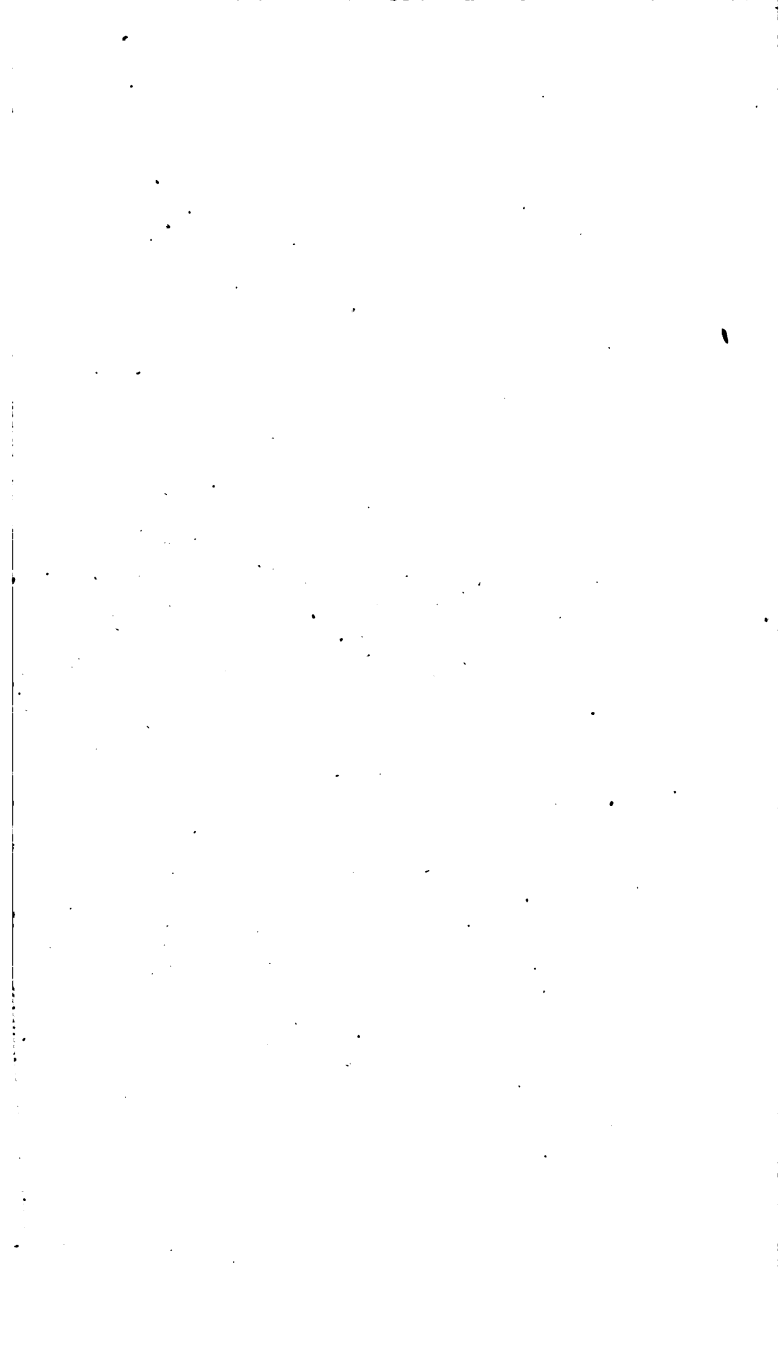
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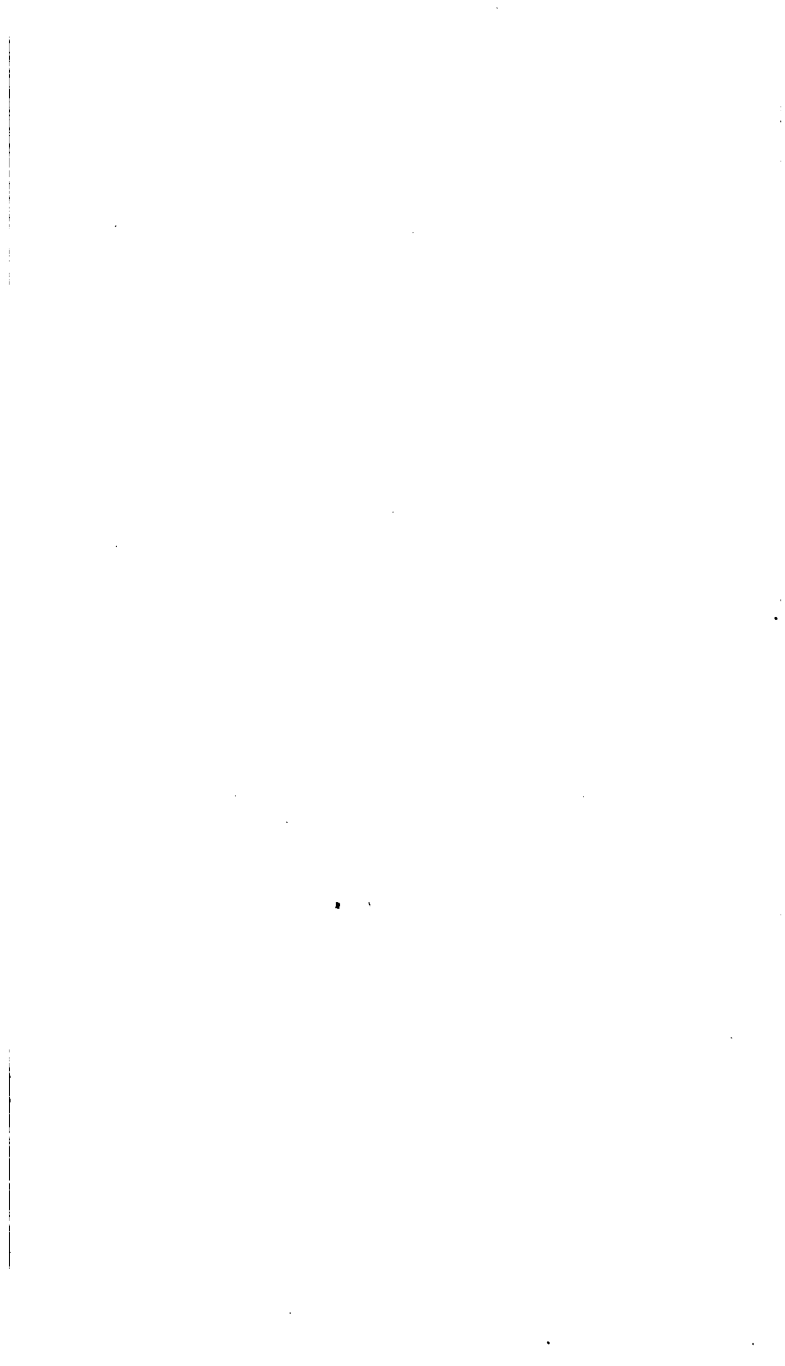
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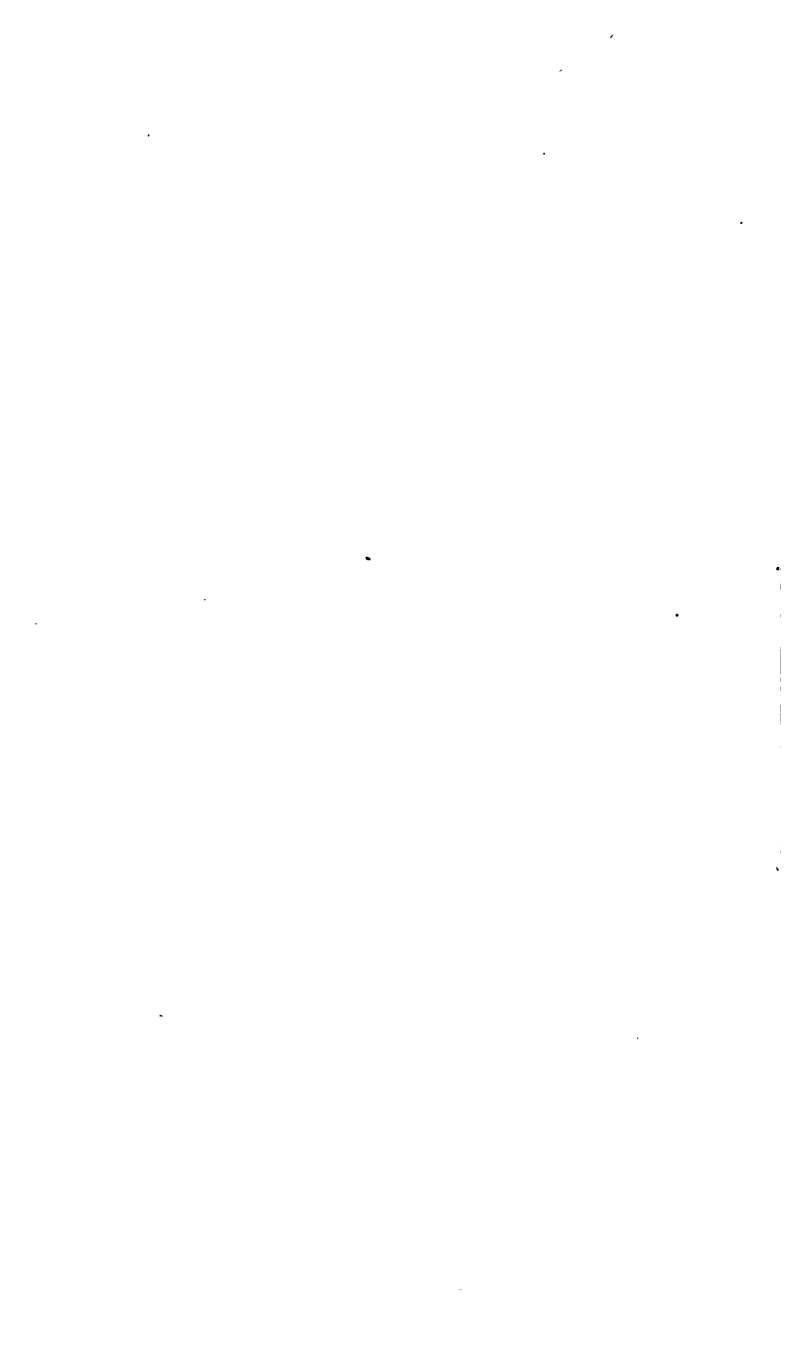


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DESCRIPTION
OF
THE ARTERIES
OF THE
HUMAN BODY.

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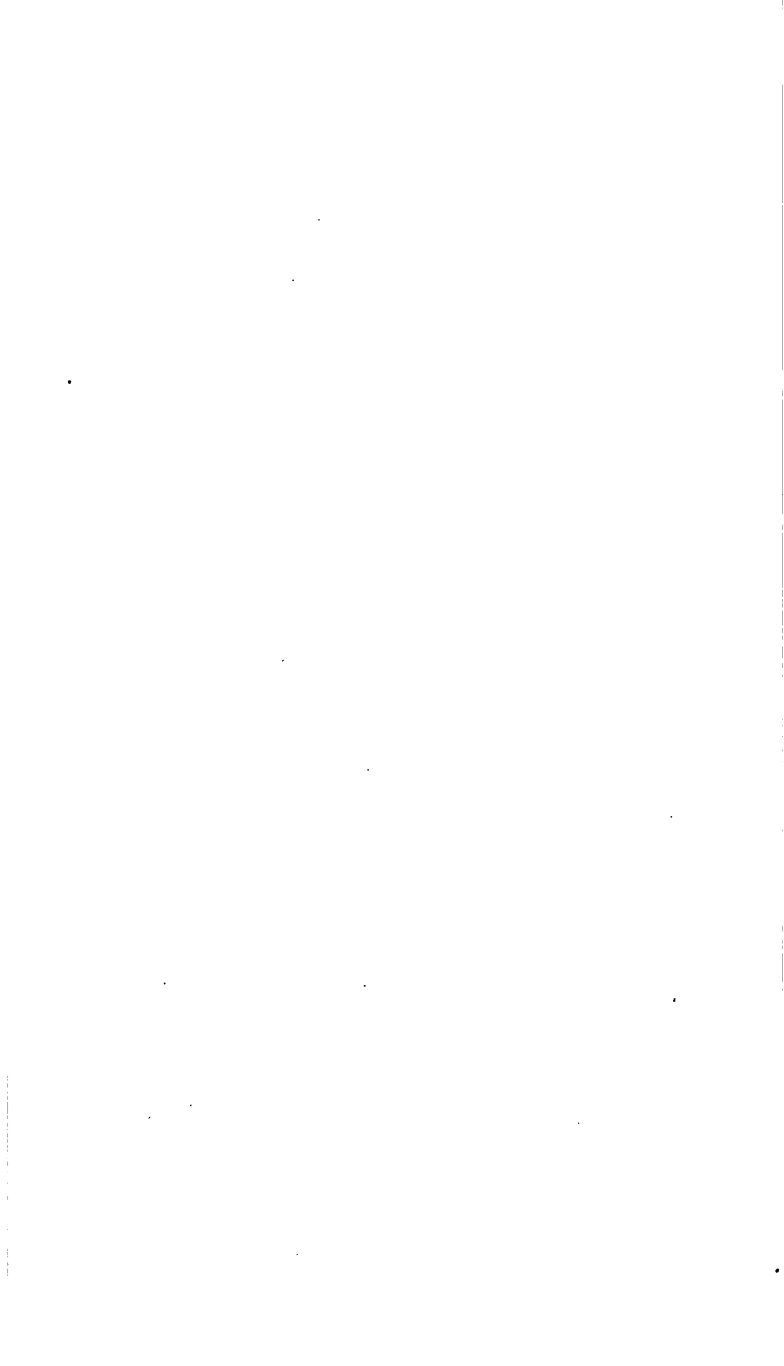
A CONCISE
ANATOMICAL DESCRIPTION
OF
T H E A R T E R I E S
OF THE
HUMAN BODY;
TOGETHER WITH
FULL DIRECTIONS FOR CUTTING DOWN UPON AND
SECURING THE SEVERAL ARTERIAL TRUNKS.
FOR
The Use of Students in Anatomy.

BY
P. BENNETT LUCAS,
MEMBER OF THE ROYAL COLLEGE OF SURGEONS, LONDON;
LICENTIATE OF THE ROYAL COLLEGE OF SURGEONS
IN IRELAND; SURGEON TO THE METROPOLITAN
FREE HOSPITAL; LECTURER UPON ANATOMY
AND PHYSIOLOGY, ETC.

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159.



TO

T. J. PETTIGREW, ESQ.

F.R.S. F.L.S.

SURGEON TO THE CHARING CROSS HOSPITAL, THE ASYLUM
FOR FEMALE ORPHANS,

&c. &c. &c.

MY DEAR SIR,

INFLUENCED by no other motives but those of sincere respect for your talents and integrity, and admiration of your unwearied ardour in the pursuits of your profession, I beg to dedicate to you the following pages, hoping that by thus placing before those for whom this work is chiefly designed an example so desirable for them to follow, they will be stimulated to pursue with additional zeal the subjects upon which it treats.

Believe me, my dear Sir,

Your faithful and obedient servant,

P. BENNETT LUCAS.

7. Store Street, Bedford Square.

TO
THE PUPILS
OF
THE CHARING CROSS HOSPITAL MEDICAL
SCHOOL.

GENTLEMEN,

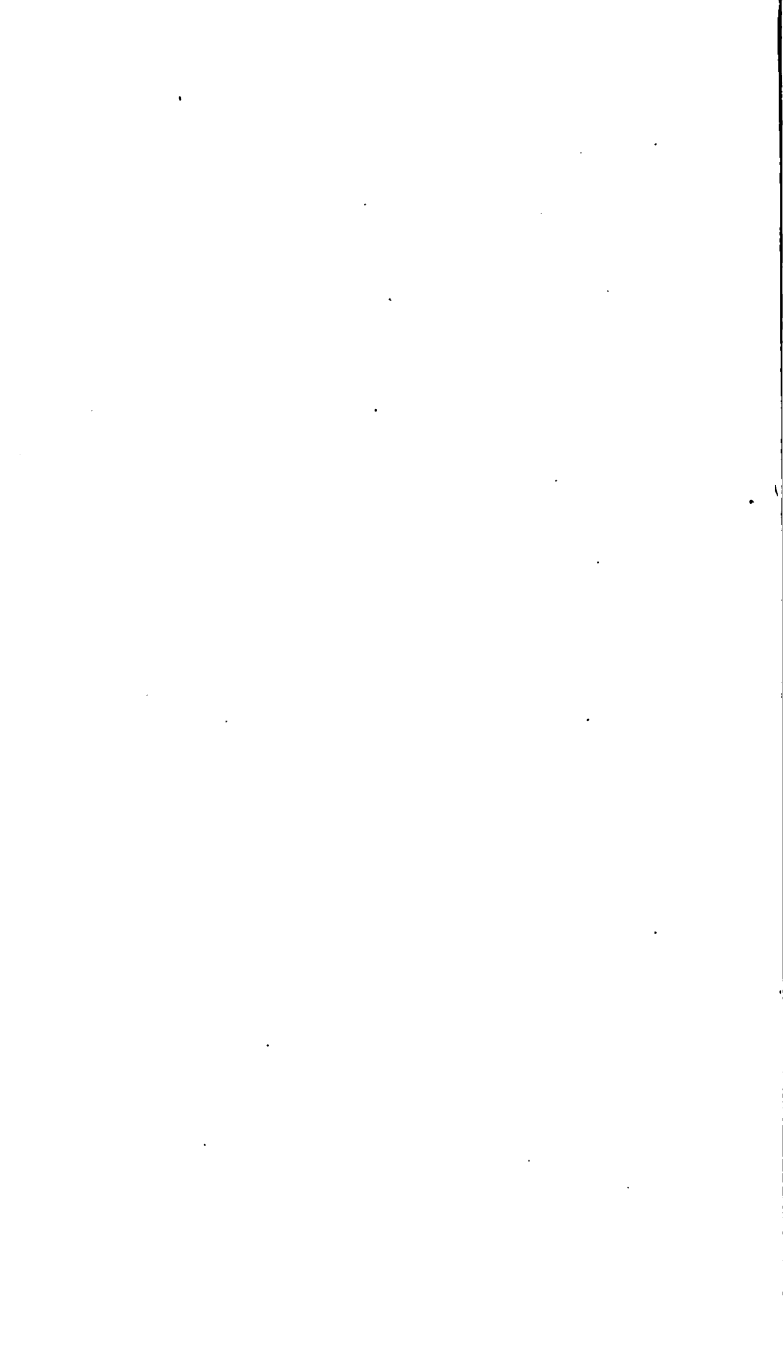
I HAVE delayed until now to acknowledge the receipt of your kind and affectionate Address, presented to me upon the occasion of my resigning my office as one of your Teachers of Anatomy, in order that I might thus publicly record the pride I feel in having been considered by you in the twofold capacity of an attentive teacher and a sincere friend.

In your own words, "that the friendship and " cordiality which has ever existed between us " may still continue," is the sincere wish of,

My dear Friends,

Yours most faithfully,

P. BENNETT LUCAS.



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ANATOMY

OF

THE ARTERIES.

THE AORTA,

ARISES from the base of the left ventricle of the heart, with which it is intimately connected by means of the lining membrane of the heart internally, the serous layer of the pericardium externally and between both by the proper fibrous coat of the vessel which passes down to the upper margin of the ventricle in the form of three semicircular portions. Immediately after its origin it dilates into three sinuses, called the lesser sinuses of Morgani, corresponding to which internally are three semilunar valves which prevent the reflux of blood into the ventricle: a little beyond these the aorta again undergoes a dilatation, which has been called its great sinus. At its origin the aorta is concealed by the pulmonary artery, which lies anterior to it, and it lies before the left auriculo-ventricular

opening. It passes first upwards, forwards, and to the right side to reach the cartilage of the second rib; then inclining backwards it passes across the trachea to the left side, and again changes its course by passing downwards and inwards to reach the left side of the body of the third dorsal vertebra, where its arch terminates. The continuation of the aorta descends along the left side of the dorsal vertebræ, inclining to the front part of the spine inferiorly, to reach the crura of the diaphragm between which it passes; and it finally arrives upon the anterior surface of the fourth lumbar vertebra, or of the intervertebral cartilage between it and the fifth, where it terminates by dividing into the primitive Iliac Arteries. The aorta is divided into three portions, viz. the Arch of the Aorta, the Thoracic Aorta, and the Abdominal Aorta. The arch is that portion of the vessel which extends from its origin to the inferior edge of the third dorsal vertebra; the thoracic aorta extends from the third dorsal vertebra to the crura of the diaphragm; the abdominal aorta extends from between the crura of the diaphragm to the inferior margin of the fourth lumbar vertebra.

ARCH OF THE AORTA,

Is divided into three portions, viz. an ascending, a transverse, and a descending. The ascending portion for its two first inches is contained within the pericardium, and is covered by the pulmonary artery;

it sends off two arteries to the heart (coronary). The transverse portion lies behind the junction of the first bone of the sternum with the second, and sends off three arteries the Arteria Innominata, or Brachio-cephalic, the left Carotid, and the left Subclavian. The descending portion lies deep, having before it the left bronchus and the left pulmonary artery, and to the right the œsophagus and thoracic duct. Within the arch several glands are contained, together with the recurrent nerve of the right side, which hooks round its transverse portion.

1. ARTERIA CORONARIA DEXTRA passes between the pulmonary artery and the right auricle of the heart, and sends off—
 - a. A branch to right auricle.
 - b. Branch to anterior part of the right ventricle.
 - c. Branch to posterior part of the right ventricle.
2. ARTERIA CORONARIA SINISTRA passes between the pulmonary artery and the left auricle, to reach the left side of the heart, and sends off—
 - a. Branch to left auricle.
 - b. Branch to left ventricle.
3. ARTERIA INNOMINATA passes from the commencement of the transverse portion of the arch to behind the right sterno-clavicular articulation,

where it divides into two branches. It crosses the trachea obliquely, and is separated from the first bone of the sternum by the the sterno-hyoid and sterno-thyroid muscles, and the left vena innominata; its branches are

1. Arteria Carotica dextra.

2. Arteria Subclavia dextra.

4. ARTERIA CAROTICA SINISTRA passes from the transverse portion of the arch to the left side of trachea, first lying upon the anterior part of that tube in the thorax, and covered by the sterno-hyoid, and sterno-thyroid muscles, the left vena innominata, and first bone of the sternum. It is longer than the right carotid artery, which arises from the arteria innominata; but in the neck it is similarly circumstanced.

5. ARTERIA SUBCLAVIA SINISTRA passes from the termination of the transverse portion of the arch nearly perpendicularly upwards to reach the first rib, lying close to the vertebræ. It is overlapped by the upper lobe of the left lung and pleura, the left vena innominata, the sterno-hyoid and sterno-thyroid muscles, and sternum. It is longer than the right subclavian artery, which is given off behind the right sterno-clavicular articulation; but after both arteries reach their corresponding first rib, the branches they give off are similar, and have the same distribution.

ARTERIÆ CAROTIDES PRIMITIVÆ,

Are very close to each other at the lower part of the neck: they pass obliquely upwards and outwards as high as the superior margin of the thyroid cartilage, sometimes a little higher, and then terminate by dividing into the internal and external carotid arteries. As the primitive carotid arteries ascend, they become more distant from each other, and at their termination are separated by the larynx and pharynx. They are undiminished in size from their origin to their termination, having given off no branches; and each is contained in a sheath common to it, the internal jugular vein, and the vagus nerve: the artery being situated internally, the vein externally, and the nerve behind, and between both. The artery is covered by the skin and cervical fascia, the sterno-hyoid, sterno-thyroid, and sterno-mastoid muscles; it is crossed by the omo-hyoid muscle, above which the artery is only covered by the skin, platysma myoides muscle, and fascia. It rests upon the longus colli and rectus anticus muscles; has the sympathetic, the cardiac, and the inferior laryngeal nerves behind it, also the inferior thyroid artery. The descendens noni nerve crosses the sheath of the vessels, passing from above obliquely downwards and inwards. The arteries into which each primitive carotid divides, are called internal and external, — not from their relative positions,—their situation in

the neck being exactly reversed — but from the parts they supply; the branches of the internal carotid being distributed to parts within the cranium, the external to the parts without, and also to the neck

1. Arteria Carotis externa.
2. Arteria Carotis interna.

ARTERIA CAROTIS EXTERNA,

Passes from the bifurcation of the primitive carotid artery upwards and inwards to the submaxillary gland; still pursuing its direction upwards, it inclines backwards, crossing the internal carotid, to reach the parotid gland, into the substance of which it enters, and a few lines below the zygoma divides into its terminal branches. It is accompanied by two veins, and is surrounded by filaments of the sympathetic nerve called *nervi molles*. The external carotid artery is very superficial in the neck, being covered only by the skin, *platysma myoides*, and fascia; it is crossed by the lingual nerve, stylo-hyoid and digastric muscles, and in the substance of the parotid gland the *portio dura* nerve crosses it. It is separated from the internal carotid artery by the stylo-glossus and stylo-pharyngeus muscles, the glosso-pharyngeal nerve, and a process of the deep cervical fascia.

The branches derived from this artery are ten in number; may be arranged into anterior, posterior, and ascending, for the convenience of description.

Anterior Branches.

1. **ARTERIA THYROIDEA SUPERIOR** arises below the cornu of the os hyoides, and arches downwards and inwards to reach the thyroid gland, the convexity of the arch looking upwards. It is accompanied by the superior laryngeal nerve, which lies posterior to it.
 - a. *Ramus hyoideus*, passes below the os hyoides; it lies under the thyro-hyoid muscle, and anastomoses with its fellow, and a similar-named branch from the lingual artery.
 - b. *Ramus superficialis* runs downwards over the sheath of the carotid vessels, to supply the muscles upon the trachea and the integuments.
 - c. *Ramus laryngeus* enters the larynx by a foramen in the thyro-hyoid membrane or thyroid cartilage, in company with the superior laryngeal nerve. Its branches are distributed to the lining membrane and small muscles of the larynx.
 - d. *Ramus thyroideus* passes downwards to the thyroid gland, which it supplies by three branches, and anastomoses with the other thyroid arteries.
2. **ARTERIA LINGUALIS** arises above the os hyoides, and passes horizontally forwards and inwards;

it next turns nearly perpendicularly upwards to the under surface of the base of the tongue; and finally passes forwards to its tip, where it terminates by anastomosing with the artery of the opposite side. The lingual arteries of opposite sides anastomose only at the tip of the tongue: each artery is accompanied by the lingual nerve, except in the second division of its course, where the hyo-glossus muscle separates them, the nerve lying superficial to the artery.

a. *Ramus hyoideus* runs above the os hyoides, and anastomoses with its fellow: it passes under the tendon of the digastric muscle.

b. *Arteriæ dorsales linguae* arise from the artery under the hyo-glossus muscle, and are distributed to the base of the tongue, tonsils, and epiglottis.

c. *Arteria sublingualis* passes behind the mylo-hyoideus muscle, to supply the muscles which pass to the tongue and the sublingual gland.

d. *Arteria ranina* is the continued trunk of the lingual artery; it runs under the lingualis muscle, passing the side of the Frenum Linguae, and terminates at the tip of the tongue by anastomosing with its fellow.

3. **ARTERIA FACIALIS** arises above the lingual, and passes upwards and inwards towards the pharynx,

running in a groove in the submaxillary gland: it then turns round the lower jaw at the anterior edge of the masseter muscle, and running obliquely upwards and inwards towards the inner angle of the orbit, terminates by anastomosing with the nasal branches of the ophthalmic artery.

- a. Arteria palatina inferior* runs upwards between the stylo-glossus and stylo-pharyngeus muscles to reach the side of the pharynx. It sends branches to the styloid muscles, tonsil, Eustachian tube, and soft palate.
- b. Arteria tonsillaris* passes upwards between the stylo-glossus and internal pterygoid muscles, and is lost in the tonsil. It also sends some small branches to the side of the tongue.
- c. Arteriæ glandulares* arise whilst the artery is in connection with the submaxillary gland; they are three or four in number, and are distributed to its substance.
- d. Arteria submental* passes from the artery immediately before it makes its turn round the lower jaw, and runs along its inferior and internal margin to the chin, supplying the submaxillary and lymphatic glands, the mylohyoid and digastric muscles, and the lower lip.
- e. Arteria labialis inferior* passes inwards to the lower lip, supplying its muscles and integu-

ments, and anastomosing with the inferior coronary and the submental arteries:

- f. Arteria coronaria inferior* passes tortuously inwards and upwards under the muscles of the lower lip, lying immediately under its mucous membrane, and uniting in the median line with the artery on the opposite side.
- g. Arteriæ massetericæ*, branches which supply the masseter and buccinator muscles, anastomosing with branches of the temporal and transverse facial arteries.
- h. Arteria coronaria superior* passes tortuously upwards and inwards to the upper lip, and is distributed to it in the same manner as the inferior coronary is to the lower. It anastomoses with its fellow; and at the point of inosculation sends branches upwards to the septum and alæ of the nose.
- i. Arteria nasi lateralis*, a small branch which is distributed to the side of the nose, and anastomoses with its fellow and the nasal branches from the superior coronary.
- k. Arteria angularis* is the terminal branch of the facial artery; it passes to the inner angle of the orbit, supplying the lachrymal sac and orbicularis palpebrarum muscle, and anasto-

anastomoses with the nasal and frontal branches of the ophthalmic artery, a branch of the internal carotid.

Posterior Branches.

4. ARTERIA MUSCULARIS passes to the sterno-mastoid muscle ; sends branches to it, the lymphatic glands, and the deep muscles of the neck ; and anastomoses superiorly with the occipital artery, and inferiorly with the cervical branches from the subclavian.
5. ARTERIA OCCIPITALIS passes from the posterior part of the artery upwards and backwards, parallel to the posterior belly of the digastric muscle ; runs in a groove at the inner side of the mastoid process of the temporal bone ; reaches the occipital bone under cover of the trachelo-mastoid, splenius capitis, complexus, and trapezius muscles ; then turns upwards ramifying by numerous branches upon the back of the cranium, and anastomoses with the cervical branches of the subclavian artery, the opposite occipital, the temporal, and the posterior auris arteries.
 - a. *Arteria Cervicalis descendens* passes downwards, supplying the deep muscles of the neck, and anastomoses with the cervicalis profunda, cervicalis ascendens, and the external branches of

the vertebral arteries — all branches of the sub-clavian artery.

b. Arteria meningeæ inferior passes through the foramen lacerum posterius, to reach the dura mater covering the cerebellum, upon which it ramifies.

c. Arteriæ superficiales ramify upon the posterior part of the cranium, pursuing three directions : viz. anterior branches, which anastomose with the temporal arteries ; posterior branches, which anastomose with the posterior auris ; and central branches, which anastomose with the artery of the opposite side.

6. **ARTERIA POSTERIOR AURIS** is a very small artery which runs backwards and upwards, in the angle formed by the cartilage of the ear and the mastoid process ; it is imbedded in the posterior part of the parotid gland, and terminates by supplying the posterior part of the concha.

a. Arteriæ musculares, branches to supply the digastric, stylo-hyoid, and sterno-mastoid muscles.

b. Arteriæ glandulares, small branches to the parotid gland.

c. Arteria stylo-mastoidea passes through the stylo-mastoid foramen, and divides into minute

branches which supply the tympanum, mastoid cells, and labyrinth. In the foetus, this artery forms a vascular zone round the osseous ring which corresponds to the meatus externus in the adult, from which minute ramifications proceed to the tympanum.

Ascending branches.

7. **ARTERIA PHARYNGEA ASCENDENS** is about the size of the posterior auris artery: it arises from the posterior part of the external carotid artery immediately after the bifurcation of the primitive trunk; passes upwards along the pharynx to the petrous portion of the temporal bone, lying upon the rectus capitis anticus muscle; and divides into its terminal branches, which enter the foramen lacerum anterius to supply the dura mater.
 - a. *Arteriae pharyngeæ* pass inwards, and are distributed to the constrictor muscles of the pharynx and the stylo-pharyngeus muscle; ramifications also extend to the soft palate, tonsils, Eustachian tube, and posterior naris.
 - b. *Arteria meningeæ* pass through the foramen lacerum anterius and foramen jugale to the dura mater.
8. **ARTERIA TRANSVERSALIS FACIEI** passes from the carotid artery, as it is covered by the parotid gland, upwards and forwards: it lies upon the masseter muscle, between the parotid duct and

zygoma, and divides into ascending and descending branches which supply the muscles of the face, anastomosing with the infra-orbital and facial arteries.

9. *ARTERIA TEMPORALIS SUPERFICIALIS* is given off in the substance of the parotid gland : it passes upwards behind the root of the zygoma, and ascends upon the temporal aponeurosis, where it terminates by dividing into anterior and posterior branches which lie immediately beneath the integuments.

- a. *Arteriæ anteriores Auris*, small branches distributed to the meatus auditorus externus.
- b. *Arteriæ capsulares*, small branches which supply the temporo-maxillary articulation.
- c. *Arteria temporalis media* pierces the temporal aponeurosis, and supplies the temporal muscle, anastomosing with the deep temporal arteries which are derived from the internal maxillary artery.
- d. *Arteria temporalis posterior* passes backwards in an arched manner to anastomose with the artery of the opposite side and the occipital artery. It supplies the scalp and occipito-frontalis muscle.
- e. *Arteria temporalis anterior* passes forwards and upwards, supplying the orbicularis palpebrarum,

occipito-frontalis, and corrugator supercilii muscles, and anastomoses with the frontal branch of the ophthalmic artery.

10. ARTERIA MAXILLARIS INTERNA pursues a tortuous course from its origin to its termination. It first passes downwards and inwards, between the perpendicular ramus of the lower jaw and its internal lateral ligament; it next inclines inwards, getting between the pterygoid muscles, and finally, by passing between the two origins of the external pterygoid muscle, it reaches the pterygo-maxillary fossa, where it divides into its terminal branches.

a. Arteria meningea media, a large branch which passes directly upwards to the base of the cranium; enters the foramen spinosum in the sphenoid bone, passes from this upon the temporal bone to reach the anterior inferior angle of the parietal, which it grooves very deeply, and is often enclosed in a canal formed in this bone. It finally branches into anterior, posterior, and middle ramifications, which supply the dura mater and bones of the cranium.

b. Arteria maxillaris inferior passes downwards between the internal lateral ligament and the lower jaw, to reach the dental foramen, which it enters and traverses the dental canal, sending branches upwards, which enter the minute

apertures in the fangs of the teeth. It ultimately divides into two branches ; one of which passes out of the mental foramen, and anastomoses with the corresponding branch of the opposite artery, the coronary and submental arteries ; the other pursues the course of the artery beneath the incisor teeth.

- c. *Arteriæ Pterygoideæ*, small branches which pass to the pterygoid muscles.
- d. *Arteriæ temporalis profundæ*, two or three branches which pass upwards between the cranium and the temporal muscle, supplying the latter.
- e. *Arteriæ Massetericæ*, a few muscular branches which supply the masseter muscle.
- f. *Arteriæ Buccales*, small branches which supply the buccinator muscle.
- g. *Arteria Dentalis* runs tortuously above the alveolar processes of the superior maxillary bone, and gives off several branches which pierce the bone to reach the antrum and the roots of the upper teeth.
- h. *Arteria infra-orbitalis* passes nearly horizontally forwards, enters the infra-orbital canal, and emerges upon the face through the infra-orbital foramen. It sends branches to the inferior oblique muscle of the eye, and

anastomoses with the transverse facial, buccal, and angular arteries.

- i. *Arteria palatina descendens* passes perpendicularly downwards through the posterior palatine canal, and divides into two branches; one of which is distributed to the soft palate; the other passes round the palate plate of the superior maxillary bone inside its alveolar arch, supplying the palate, and anastomoses in the foramen incisivum with the nasal artery.
- k. *Arteria nasalis* enters the superior meatus of the nose by the spheno-palatine foramen, supplies the pharynx and the mucous membrane of the nose. One branch accompanies the vidian nerve through the vidian foramen of the sphenoid bone, and expends itself upon the Eustachian tube.

ARTERIA CAROTIS INTERNA,

Passes from the bifurcation of the primitive carotid upwards to the base of the cranium. It lies to the outer side of the external carotid artery, and is separated from it by the stylo-glossus and stylo-pharyngeus muscles, the glosso-pharyngeal nerve, and a portion of the parotid gland is crossed by the lingual nerve, digastric and stylo-hyoid muscles; and is accompanied by the internal jugular vein, the vagus, and sympathetic nerves. At the base of

the cranium it enters the foramen caroticum in the petrous portion of the temporal bone ; follows the course of the carotid canal, which conducts it to the cavernous sinus, through which it runs. The artery, having arrived at the base of the anterior clinoid process, ascends by the side of the sella turcica, perforates the dura mater, and terminates at the base of the brain by dividing into two large branches.

In the dissection of this artery, the tortuous course it pursues from its origin to its termination should be observed ; also the intimate connection it holds to the pharynx and tonsil, and the relation it bears to the several nerves in the cavernous sinus.

1. **ARTERIÆ TYMPANI** are two or three small branches which pass from the artery as it lies in the carotid canal, to the tympanum, and which anastomose with the stylo-mastoidean branch of the posterior auris.
2. **ARTERIÆ RECEPTACULI** are given off from the artery as it lies in the cavernous sinus, and are distributed to the dura mater and the nerves contained in the sinus.
3. **ARTERIA OPHTHALMICA** arises from the carotid after it has passed the cavernous sinus. It passes forwards, and enters the orbit by the foramen opticum, lying beneath the optic nerve, and divides into numerous branches, which supply the eye and its appendages.

- a. Arteria lachrymalis* runs along the upper border of the external rectus muscle, sends branches through the malar bone, and terminates by supplying the lachrymal gland with several small branches.
- b. Arteria centralis Retinæ* penetrates the optic nerve runs in its centre to the back part of the vitreous humour, where it divides into several minute branches which ramify upon the anterior or vascular layer of the retina: one long branch penetrates the vitreous humour which supplies the hyaloid membrane, and terminates upon the back part of the capsule of the crystalline lens.
- c. Arteria supra-orbitalis* passes above the optic nerve and the muscles in the orbit lying immediately beneath the periosteum, and advances forwards to the supra-orbital notch, supplying in its course the superior rectus and levator palpebræ muscles. It turns upwards upon the forehead, and anastomoses with the anterior branches of the temporal artery; and here supplies the occipito-frontalis and corrugator supercilii muscles.
- d. Arteriæ ciliares* consist of long and short branches. The short set are from fourteen to sixteen in number; they surround the optic nerve, pierce the sclerotic coat of the eye,

and terminate by supplying the choroid membrane. The long ciliary arteries are two in number: they also pierce the sclerotic coat, but pass forwards between this coat and the choroid to the ciliary ligament, through which each passes, and divides into two branches, which, by anastomosing with each other, form a vascular circle around the larger circumference of the iris. From this circle minute branches pass to near the margin of the pupil, and again unite, forming a lesser vascular circle.

- e. *Arteriæ musculares* supply the seven muscles within the orbit.
- f. *Arteria ethmoidalis posterior* passes through the foramen orbitarium internum posterius, to supply the mucous membrane lining the ethmoidal cells, and the nasal fossæ.
- g. *Arteria ethmoidalis anterior* passes through the foramen orbitarium internum anterius, in company with the nasal division of the first branch of the fifth nerve, to supply the mucous membrane lining the frontal sinus and the nasal fossæ.
- h. *Arteriæ palpebrales* arise near the inner angle of the orbit, and pass forwards, above the tendo oculi, to the palpebræ; supplying their muscles, the tarsal cartilages, the Meibomian

glands, the palpebral conjunctiva, the caruncula lachrymalis, plica semilunaris, and the lachrymal sac.

i. *Arteria nasalis* passes above the tendo oculi, supplying the lachrymal sac and inferior eyelid, and anastomosing with the angular artery from the facial.

k. *Arteria frontalis* passes out of the orbit with the nasal artery, turns upwards upon the forehead, supplying the occipito-frontalis and corrugator supercilii muscles, and anastomoses with the supra-orbital artery.

4. ARTERIA COMMUNICANS POSTERIOR runs backwards and inwards to meet the posterior cerebral artery, with which it unites, thus forming the sides of the circle of Willis.

5. ARTERIA CEREBRI ANTERIOR arises opposite the inner extremity of the fissure of Sylvius, runs forwards and inwards to the median fissure which separates the anterior lobes of the cerebrum, then turns round the anterior curved portion of the corpus callosum, and runs along its upper surface, over-lapped by the hemispheres of the cerebrum, sending in its course numerous branches to the cerebral convolutions.

a. *Arteria communicans anterior*, a small artery which runs transversely, connecting the arteries

of opposite sides as they lie in the longitudinal fissure.

b. Arteria corporis callosi runs along the upper surface of the corpus callosum, sending branches to the corresponding cerebral hemisphere.

c. Arteria Cerebri media passes obliquely outwards along the fissure of Silvius, supplying the anterior and middle lobes of the cerebrum; it also sends off,

a. Arteria choroideæ, which pass through the fissure at the under surface of the inferior cornu of the lateral ventricle, and supplies the choroid plexus.

ARTERIÆ SUBCLAVIÆ,

Are two in number; the right arising from the arteria innominata, the left from the arch of the aorta. The course of the left subclavian artery, from its origin to the tracheal edge of the anterior scalenus muscle, has been already described at page 4; it now remains to consider how the right subclavian is circumstanced from its origin to the same point; after doing which, one description will be applicable to both arteries, as they are similarly circumstanced in their relations to surrounding parts, and when regular send off the same

number of branches. The right subclavian, in this its first stage, passes upwards and outwards, lying upon the longus colli muscle; between which and the vessel are the recurrent and sympathetic nerves, and three or four lymphatic glands. It is covered by the skin and superficial cervical fascia, by the clavicular attachment of the sterno-mastoid muscle, and by the sterno-hyoid and sterno-thyroid muscles. The nervus vagus crosses it anteriorly, as this nerve is getting into the thorax, and also some branches of the sympathetic nerve.

Second stage, or while it is covered by the anterior scalenus muscle. — It lies on the middle scalenus muscle, and has the upper part of the pleura in contact with its inferior aspect. It is covered by the skin and superficial fascia, and the clavicular attachment of the sterno-mastoid muscle: the subclavian vein lies anterior to it, also the phrenic nerve, both of which are separated from it by the anterior scalenus muscle.

Third stage. — From the external edge of the scalenus muscle the artery inclines downwards and outwards; it lies upon the middle scalenus muscle and upper surface of the first rib, and is covered by the skin, platysma myoides muscle, and superficial fascia. The brachial plexus of nerves is superior and external to the artery, the subclavian vein anterior and inferior; and these parts are contained in a triangular space formed by the clavicle inferiorly, the omo-hyoid muscle superiorly and exter-

nally, and the scalenus anticus muscle internally. The external jugular vein opens into the subclavian vein in this situation; and two arteries—the transversalis colli and transversalis humeri, branches from the thyroid axis—cross it in a transverse direction to their distribution.

1. *ARTERIA VERTEBRALIS* arises from the upper and posterior part of the subclavian artery, passes upwards, and enters the foramen in the transverse process of the fifth or sixth cervical vertebra, runs through the several foramina in the vertebræ above, passes through the foramen magnum in the occipital bone, meets its fellow at the commencement of the basilar process, and by uniting with it at this point forms the basilar artery. The vertebral artery from its origin pursues a straight course until it passes the foramen in the second cervical vertebra; after which it forms two curves; one to reach the foramen in the atlas, the other as it passes from this vertebra to the cuneiform process of the occipital bone, to reach which it pierces the dura mater. It is accompanied by the vertebral vein; both vessels passing at right angles and anterior to the cervical nerves.

a. Arteriæ medullæ spinalis, transversæ, small branches which pass inwards to the spinal marrow as the artery ascends through the vertebral foramina.

b. Arteriæ meningææ, branches which are given

to the dura mater as the vertebral artery is passing from the atlas to the cuneiform process of the occipital bone.

- c. Arteria Cerebelli inferior* passes downwards and backwards to the cerebellum, and is distributed to the pia mater investing its posterior inferior surface; it anastomoses with the superior arteries of the cerebellum.
- d. Arteriæ medullæ spinales* are sent off from the vertebral artery as it is passing through the foramen magnum: they descend one anterior, the other posterior, upon the spinal marrow to the lumbar region, and terminate in minute ramifications upon the cauda equina. These arteries are very long and tortuous, and form numerous anastomoses with each other and with the arterial ramifications, which pass through the intervertebral foramina.
- e. Arteria basilaris* is formed by the union of the two vertebral arteries, and in this manner of formation is an exception to the general rule of origin which pervades the arterial system. It passes from the anterior margin of the foramen magnum to the posterior clinoid process of the sphenoid bone: it lies in a shallow groove corresponding to the median line of the pons varolii; is connected to this part by the arachnoid membrane, which partially

covers it; and terminates by dividing into four branches.

a. β. Arteriæ Cerebelli superiores pass backwards and outwards to the upper surface of the cerebellum. They send branches to the pia mater, investing the nates and testes, the pineal gland and the velum interpositum; also branches through the internal auditory foramina to the organs of hearing; and are finally expended upon the pia mater covering the upper surface of the cerebellum, where they anastomose with the inferior arteries of that organ.

γ. δ. Arteriæ cerebri posteriores pass outwards and backwards around the crura cerebri, to reach the inferior surface of the posterior lobes of the cerebrum, to which they are distributed. At the angle formed where these vessels turn backwards they receive the posterior communicating arteries from the internal carotid artery.

2. **ARTERIA MAMMARIA INTERNA** arises from the inferior aspect of the subclavian artery, opposite to the vertebral artery, and passing downwards and forwards enters the thorax: it descends between the pleura and the cartilages of the ribs, as far as that of the seventh, where it divides into two branches; one of which, the continued trunk, runs between the peritoneum

and abdominal muscles, and anastomoses with the inferior epigastric artery, a branch of the external iliac.

- a. *Arteriæ intercostales anteriores* are five or six in number ; they pass outwards along the superior intercostal spaces between the pleura and intercostal muscles, and anastomose with the intercostal arteries derived from the aorta. They supply the thorax and the mammary glands. In the female, the branches to the latter organs are proportionally of greater size.
- b. *Arteriæ mediastini* pass to the anterior mediastinum, supplying the pleura, diaphragm, and triangularis sterni muscle. In the foetus, large branches are sent to the thymus gland.
- c. *Arteria comes nervi phrenici* arises as the phrenic nerve passes the mammary artery ; it accompanies this nerve along the side of the pericardium, and is ultimately distributed to the diaphragm, where it anastomoses with the phrenic arteries derived from the abdominal aorta.
- d. *Arteria musculo-phrenica*, passes outwards in the direction of the cartilages of the false ribs, and is distributed to the inferior intercostal muscles, the abdominal muscles, and the diaphragm.
- e. *Arteria epigastrica superior*, the continued trunk of the internal mammary artery, descends

between the peritoneum and abdominal muscles, supplying these parts ; and anastomoses, behind the recti and transversalis muscles of the abdomen, with the inferior epigastric arteries.

3. **AXIS THYROIDEUS** is a short trunk which arises immediately after the vertebral artery ; it lies at the trachial margin of the anterior scalenus muscle, inclines upwards and forwards, and soon divides into its branches.

a. Arteria thyroidea inferior runs in a tortuous manner upwards and inwards, behind the sheath of the carotid vessels and the sympathetic nerve, to the side of the trachea, along which it runs to reach the thyroid gland, where it terminates by anastomosing in that organ with the artery of the opposite side and the superior thyroid artery derived from the external carotid. In its passage upwards it sends branches to the trachea and œsophagus, and is accompanied by the inferior laryngeal nerve.

b. Arteria cervicalis ascendens passes upwards upon the anterior surface of the anterior scalenus muscle, parallel to the phrenic nerve, supplying the deep muscles of the neck, and anastomosing, through the intervertebral foramina, with branches of the vertebral artery.

c. Arteria, supra-scapularis (vel transversalis

humeri) passes outwards parallel but posterior to the clavicle, to reach the notch in the superior costa of the scapula, over which it passes to the supra-spinal fossa. It gives off —

- a. Arteria Acromialis superior*, which is distributed to the acromial attachments of the trapezius and deltoid muscles, and which anastomoses with the thoracica-acromialis artery from the axillary.
- β. Arteria supra-spinalis* is lost in the supra-spinatus muscle.
- γ. Arteria infra-spinalis* passes behind the glenoid cavity, and supplies the infra-spinatus and teres minor muscles, and anastomoses with the subscapular artery.
- d. Arteria scapularis posterior* (vel transversalis colli) passes outwards and backwards across the upper part of the anterior scalenus muscle to the space between the trapezius and sterno-mastoid muscles, turns downwards along the vertebral costa of the scapula, and anastomoses with the subscapular artery from the axillary.
- α. Arteriæ glandulares*, small branches to the cervical glands.
- β. Arteria cervicalis superficialis* arises oppo-

site the anterior margin of the trapezius muscle; supplies the integuments and glands at the side and back of the neck; and anastomoses above with the occipital artery, and at the shoulder with the supra-scapular.

γ. *Arteria scapularis posterior*, the continued trunk, passes underneath the levator anguli scapulæ muscle, to the posterior angle of the scapula; it then runs along the vertebral margin of that bone to its inferior angle lying under the rhomboid muscles, to which it gives branches; it also supplies the trapezius, latissimus dorsi, teres major, and serratus magnus muscles, and anastomoses with the subscapular arteries and the posterior branches of the aortic intercostal arteries.

4. *ARTERIA CERVICALIS PROFUNDA* passes outwards and backwards between the transverse processes of the sixth and seventh cervical vertebræ, and through the brachial plexus of nerves; it ascends upon the cervical vertebræ as high as the occipital bone, and anastomoses with the occipital and vertebral arteries. It lies very deep, and supplies the deep-seated muscles.

5. *ARTERIA INTERCOSTALIS SUPERIOR* passes from the posterior aspect of the subclavian artery

downwards and backwards in front of the necks of the first and second ribs, and anastomoses with the first aortic intercostal artery. It supplies the first and second intercostal spaces, anastomosing with the anterior intercostal arteries. Upon the right side, in general, this artery supplies also the third intercostal space.

ARTERIA AXILLARIS,

the continued trunk of the subclavian artery, extends from the inferior border of the first rib to the inferior margin of the tendon of the latissimus dorsi and teres major muscles. When the arm is hanging by the side, this artery forms a curve, the convexity of which looks towards the acromion process, the concavity towards the chest; but when the arm is abducted from the side, it passes through the axilla in an oblique direction downwards, backwards, and outwards. The axillary vein lies at first internal and inferior to the artery; but lower down it lies anterior to it: the brachial plexus of nerves at first lies superior and external to it; in the middle of its course its branches surround it; and in its inferior division its nerves lie in the following order: the internal cutaneous, the inner root of the median, and the ulnar nerve, lie to the inner side of the artery; the external cutaneous, and external root of the median to its outer side; and the circumflex and musculo-spiral nerve behind it. The axillary

artery first rests upon the first intercostal space, and superior digitation of the serratus magnus muscle. It is next supported by the nerves which surround it; and lastly, by the subscapular muscles, and the tendon of the latissimus dorsi and teres major muscles. It is covered by the clavicular attachment of the pectoralis major and costo-coracoid ligament superiorly, by the pectoralis major and minor in the middle of its course, and by the pectoralis major only in its last division.

1. *ARTERIA THORACICA-ACROMIALIS* arises from the anterior part of the axillary artery, and passes between the clavicle and the lesser pectoral muscle towards the line of contact of the deltoid and great pectoral muscles, and divides into three sets of branches: the first passes inwards and backwards to the serratus magnus and pectoral muscles, and anastomoses with the mammary arteries; the second passes between the deltoid and great pectoral muscles, supplying them, and anastomosing with the circumflex arteries from the axillary, and the superior profunda from the brachial artery; the third runs toward the acromion process of the scapula, ramifying upon its upper surface, and anastomoses with the transversalis colli and supra-scapular arteries from the thyroid axis, and supplies the deltoid muscle and shoulder joint.

2. *ARTERIA THORACICA SUPREMA* passes above

the upper margin of the lesser pectoral muscle, supplying it and the great pectoral muscle, and anastomoses with the internal mammary and intercostal arteries.

3. ARTERIA THORACICA ALARIS arises in general behind the lesser pectoral muscle, and soon divides into several branches which supply the axillary glands, the pectoral, subscapular, and intercostal muscles, and anastomose with the intercostal and external mammary arteries.
4. ARTERIA MAMMARIA EXTERNA (vel thoracica longa) passes under the inferior edge of the lesser pectoral muscle, descends along the outer side of the thorax between the pectoralis major and serratus magnus muscles, and anastomoses with the intercostal and internal mammary arteries.
5. ARTERIA SUBSCAPULARIS arises from the axillary artery, close to the lower border of the subscapular muscle; it passes downwards and backwards parallel to the axillary margin of the scapula, and after a short course divides into an anterior and posterior branch.
 - a. *Ramus anterior* proceeds downwards to the inferior angle of the scapula, supplying the subscapular, serratus magnus, and latissimus dorsi muscles, and anastomoses with the posterior scapular artery from the transversalis colli.

- b. Ramus posterior* passes from the axilla around the axillary margin of the scapula, between it and the teres major muscle, to reach the dorsum of the bone, and divides into an ascending and descending branch; the former supplies the infra-spinatus and deltoid muscles, and anastomoses with the posterior scapular, circumflex, supra-scapular, and thoracica-acromialis arteries: the descending runs downwards and backwards, supplies the latissimus dorsi and teres major muscles, and anastomoses with the posterior scapular and subscapular arteries.
6. **ARTERIA CIRCUMFLEXA POSTERIOR** passes backwards out of the axilla, between the humerus and long head of the triceps muscle, and above the latissimus dorsi muscle; it winds round the neck of the humerus, supplies the deltoid muscle and the capsular ligament of the shoulder joint, and anastomoses with the anterior circumflex artery, and the superior profunda artery from the brachial.
7. **ARTERIA CIRCUMFLEXA ANTERIOR** is smaller than the posterior circumflex, and passes outwards and forwards between the coraco-brachialis and short head of the biceps and the humerus to the bicipital groove, where it divides into two sets of branches: one ascends by the long head of the biceps to the shoulder joint; the other winds round the humerus, supplying the deltoid

muscles, and anastomoses with the posterior circumflex, the thoracica-acromialis, and the superior profunda arteries.

ARTERIA BRACHIALIS,

is the continuation of the axillary artery. It extends obliquely downwards, outwards, and forwards, from the inferior edge of the tendon of the teres major muscle, to about an inch below the bend of the elbow. It is covered by the skin and fascia of the arm, and is overlapped by the coraco-brachialis muscle, and the inner edge of the biceps muscle; and at the bend of the elbow, where it lies very deep, it is covered by the aponeurosis sent off from the biceps tendon: here it divides into the ulnar and radial arteries. This artery is accompanied by two veins and the median nerve; the latter lies at first to its acromial side, it crosses in front of the vessel about the middle of the arm, and at the bend of the elbow it lies to its ulnar side.

1. **ARTERIA PROFUNDA SUPERIOR** arises from the brachial artery a few lines below the tendon of the teres major muscle: it passes downwards and outwards, supplies the triceps and coraco-brachialis muscles, and anastomoses with the circumflex and thoracica-acromialis arteries under the deltoid muscle. It divides into two branches.

a. *Ramus descendens* passes to the back part of

the elbow joint under cover of the triceps muscle, and anastomoses with the recurrent branches of the ulnar and interosseal arteries.

b. Arteria musculo-spiralis accompanies the musculo-spiral nerve, descends to the external condyle of the humerus between the supinator radii longus and brachialis anticus muscles, and anastomoses with the radial recurrent artery.

2. **ARTERIA NUTRITIA HUMERI** passes through the fibres of the coraco-brachialis muscle, and enters the oblique canal in the humerus to be distributed to the medullary membrane. Its direction is downwards towards the elbow.
3. **ARTERIA PROFUNDA INFERIOR** arises from the brachial artery about the centre of the arm, passes downwards and inwards to the cleft between the inner condyle of the humerus and the olecranon, and anastomoses with the posterior ulnar recurrent and the anastomotica magna arteries. It is accompanied by the ulnar nerve.
4. **ARTERIA ANASTOMOTICA MAGNA** arises from the brachial artery as it lies upon the brachialis anticus muscle ; it passes obliquely through the internal intermuscular ligament towards the inner condyle, and divides into two sets of branches, which supply the muscles attached to the inner condyle. The ascending set anastomoses with the inferior profunda artery, the descending set with the ulnar recurrent arteries.

ARTERIA RADIALIS,

is in direction, though not in size, the continued trunk of the brachial ; it runs from the bend of the elbow obliquely downwards and outwards towards the base of the metacarpal bone of the thumb ; turns round the radial edge of the carpus beneath the extensor tendons of the thumb ; passes forwards between the metacarpal bones of the thumb and index finger ; reaches the palm of the hand by passing between the heads of the abductor indicis muscle ; traverses the palm of the hand, forming the deep palmar arch, which is perfected by the artery anastomosing with the arteria communicans from the ulnar artery. Two venæ comites run parallel to the radial artery ; but the radial nerve accompanies it only for its superior and middle thirds. In the fore-arm it is covered by the skin and fascia, and is overlapped superiorly by the belly of the supinator longus muscle.

1. **ARTERIA RADIALIS RECURRENTS** arises from the artery a few lines below its origin, and passes upwards and outwards between the supinator longus and brachialis anticus muscles, to anastomose with the musculo-spiral branch of the superior profunda. It supplies the muscles in its course, and the synovial membrane of the elbow joint.
2. **ARTERIÆ MUSCULARES**, small branches which pass to the muscles upon either side of the artery.

3. **ARTERIA SUPERFICIALIS VOLÆ** arises from one to three inches above the carpal end of the radius ; passes downwards and inwards over the annular ligament, covered by a layer of fascia ; supplies the muscles of the thumb and the palmar integuments, and perfects the superficial palmar arch by uniting with the ulnar artery. ♣
4. **ARTERIA ANTERIOR CARPI RADIALIS** passes across the carpal bones, supplying the synovial membrane and the ligaments of the wrist joint, and anastomoses with the anterior interosseous artery ; and the anterior carpal artery of the ulnar.
5. **ARTERIA DORSALIS CARPI RADIALIS** passes across the carpal bones beneath the extensor tendons, supplies the ligaments and the synovial membrane of the wrist, and anastomoses with the posterior carpal artery from the ulnar.
6. **ARTERIÆ DORSALES POLLICIS** run along the dorsum of the thumb—one on its radial, the other on its ulnar edge—supplying the extensor tendons and the integuments.
7. **ARTERIA DORSALIS INDICIS** runs along the dorsal surface of the index finger.
8. **ARTERIA PRINCEPS POLLICIS** arises when the artery is about to reach the palm of the hand ; it passes forwards between the abductor indicis and

adductor pollicis muscles, along the metacarpal bone of the thumb, at the distal end of which it divides into branches which run along either side of the phalanges, and unite upon the palmar aspect of the last phalanx: from this union several small arteries are distributed to its extremity.

9. ARTERIA RADIALIS INDICIS runs along the radial side of the index finger to its extremity, where it unites with a corresponding collateral branch derived from the superficial palmar arch; it also anastomoses with the princeps pollicis.

10. ARTERIA PALMARIS PROFUNDA passes between the metacarpal bones of the thumb and index finger, beneath the flexor tendons and their lumbricales muscles, to the metacarpal bone of the little finger, where it unites with the communicating artery from the ulnar, thus forming the deep palmar arch.

ARTERIA ULNARIS,

passes from the bifurcation of the brachial artery obliquely downwards and inwards; when it arrives at the wrist, it turns round the radial edge of the pisiform bone, over the annular ligament, bound down and protected by a strong layer of fascia which passes from the apex of the pisiform bone to the annular ligament; it then runs obliquely for-

wards and outwards to the metacarpal bone of the index finger, where it unites with the superficialis volæ and radialis indicis, both branches of the radial artery. The superficial palmar arch is thus chiefly formed by this artery.

In the first part of its course the ulnar artery lies deep, and is covered by the superficial muscles which arise from the inner condyle; in the middle of the arm it is overlapped by the flexor carpi ulnaris; and at the wrist it is covered by two layers of fascia, and is comparatively superficial. In the palm of the hand it is covered by the palmaris brevis muscle, and palmar aponeurosis. It is accompanied by two veins in its entire course, and by the ulnar nerve in its middle and inferior extent.

1. ARTERIA RECURRENS ANTERIOR passes from the artery an inch below its origin upwards, under the pronator radii teres muscle, and upon the brachialis anticus, supplying these muscles, and anastomosing at the inner condyle with the anastomotica magna and inferior profunda arteries.
2. ARTERIA RECURRENS POSTERIOR runs backwards and upwards to behind the cleft between the internal condyle and the olecranon, where it anastomoses with the superior and inferior profunda arteries and the anastomotica magna. It supplies the triceps muscle and the synovial membrane of the elbow joint.

3. **ARTERIA INTEROSSEA** passes at first downwards and backwards from the ulnar artery to reach the upper border of the interosseous ligament; here it divides into two branches, which run upon the interosseous ligament to the wrist.

a. Arteriæ recurrentes anteriores pass upwards upon the anterior part of the elbow joint, where they anastomose with the *anastomotica magna* artery.

b. Arteria interossea anterior descends upon the anterior surface of the interosseous ligament, beneath the flexor muscles, and divides into two branches: one of which goes to the quadratus pronator muscle, and joins the anterior carpal arteries and the deep palmar arch; the other passes through the interosseous ligament to the posterior surface of the radius, to anastomose with the posterior interosseal and posterior carpal arteries. This artery is accompanied by two veins and the anterior interosseal nerve.

c. Arteria interossea posterior passes between the oblique ligament and the upper border of the interosseous ligament, to the back of the forearm, and divides under cover of the anconeus muscle into two branches.

d. Arteria recurrens posterior passes to the cleft between the external condyle and ole-

cranon, beneath the supinator brevis and anconeus muscles, and anastomoses with the radial recurrent, musculo-spiral and superior profunda arteries.

a. *Arteria descendens posterior* passes between the extensor muscles, downwards; and at the posterior part of the wrist anastomoses with the dorsal carpal arteries, and the posterior branch of the anterior interosseal artery.

4. **ARTERIÆ MUSCULARES**, several small branches which run to the muscles on either side of the ulnar artery.

5. and 6. **ARTERIÆ CARPI ULNARES ANTERIORES ET POSTERIORES** run along the corresponding aspects of the carpus, and anastomose with the opposite branches from the radial artery, and with the interosseous artery.

7. **ARTERIA COMMUNICANS** passes backwards between the flexor brevis and abductor minimi digiti muscles, and anastomoses with the palmar profunda artery from the radial, thus perfecting the deep palmar arch.

8. **ARTERIA PALMARIS SUPERFICIALIS** passes across the palm of the hand towards the head of the metacarpal bone, supporting the index finger; it then turns backwards to the ball of the thumb, and anastomoses with the superficialis volæ and the radialis indicis arteries, thus forming the greater part of the superficial palmar arch.

PALMAR ARCHES.

DEEP PALMAR ARCH,

is formed by the palmar profunda of the radial artery uniting with the arteria communicans from the ulnar. This arch is nearer the carpus than the superficial palmar arch, and is smaller: its convexity looks towards the fingers. From its convexity five small branches in general proceed to supply the interossei muscle and to anastomose with the digital arteries from the superficial palmar arch.

SUPERFICIAL PALMAR ARCH,

is formed by the arteria palmaris of the ulnar artery anastomosing with the superficialis volæ from the radial. It passes obliquely across the palm of the hand, its convexity being towards the little and ring fingers; it is larger, more superficial, and nearer the fingers than the deep arch. From its concave aspect, muscular branches are sent off to the muscles and tendons in the palm of the hand; and from its convexity four digital arteries proceed, and are distributed as follows:—

1. Runs along the ulnar edge of the little finger, and anastomoses with the ulnar branch of the second.
2. Runs to the cleft between the little and ring fingers, divides into two branches which pass along the opposed sides of these fingers to their extremities.

3. Runs to the cleft between the ring and middle fingers, and divides into two branches which supply their opposed sides.

4. Runs to the cleft between the middle and index fingers, and supplies their opposed sides.

The thumb and radial edge of the index finger are supplied by branches from the radial artery.

AORTA THORACICA.

From the termination of the arch of the aorta at the body of the third dorsal vertebra, the thoracic aorta commences ; it descends, inclining towards the anterior surfaces of the bodies of the vertebræ, and terminates between the crura of the diaphragm ; and being in close apposition with the bodies of the vertebræ it necessarily presents a curve, the concavity of which looks forward ; and, after the vessel has passed between the crura of the diaphragm into the abdomen, it again inclines towards the left side, and thus forms a lateral curve, the convexity looking towards the right side.

The thoracic aorta is contained in the posterior mediastinum, and is covered by the root of the left lung ; the left auricle of the heart and the pericardium lie anterior to it ; the œsophagus with its accompanying nerves lie to the right side of the vessel above, cross it obliquely in the centre, and lie to its left side inferiorly ; the vena azygos is to its right side ; also the thoracic duct ; and the in-

tercostal veins of the left side pass behind it to reach the vena azygos.

1. **ARTERIÆ PERICARDIACI**, small branches which are sent to the pericardium from the anterior part of the vessel, and which are very irregular in their origin.
2. **ARTERIÆ MEDIASTINI**, small branches which are distributed to the cellular tissue in the posterior mediastinum, and to the anterior ligaments of the dorsal vertebræ.
3. **ARTERIÆ BRONCHIALES** arise from the aorta soon after it has formed its arch, and diverging incline forwards and outwards to the corresponding bronchiæ, accompanying those tubes to the lungs. They supply the left auricle of the heart, the bronchial glands, the œsophagus, and cellular tissue of the lungs.
4. **ARTERIÆ ŒSOPHAGIALES** are usually four or five in number ; they arise from the anterior aspect of the aorta, and pass obliquely downwards to the œsophagus, supplying its muscular coats and mucous membrane ; they ramify upwards and downwards, anastomosing superiorly with the inferior thyroid arteries, and inferiorly with the phrenic and gastric arteries.
5. **ARTERIÆ INTERCOSTALES** arise from the posterior part of the thoracic aorta, pass obliquely backwards and outwards to reach the intercostal

spaces, and divide into two branches. Their number depends upon the number of intercostal spaces supplied by the superior intercostal artery from the subclavian.

- a. *Rami posteriores* pass directly backwards between the vertebræ and the costo-transverse ligament, and supply the vertebræ, spinal cord, and the mass of muscles which fill up the vertebral grooves.
- b. *Rami anteriores* pass forward in the direction of the original trunk, lying at first between the pleura and external intercostal muscle, and next between both intercostal muscles : each divides into a superior and inferior branch, which take the course of the rib above and below, supplying the pleura and intercostal muscles.

AORTA ABDOMINALIS,

passes from between the crura of the diaphragm to the fourth or fifth lumbar vertebra, where it divides into the primitive iliac arteries. It lies upon the bodies of the lumbar vertebræ; is in connection by its anterior surface with the liver, pancreas, duodenum, and mesentery; has the vena cava lying to its right side; and sends its branches to the abdominal viscera, the kidneys, testes, and ovaria.

In general, at the bifurcation of this vessel,

a small artery called the middle sacral is continued to the os coccygis, and is considered by some anatomists as the continuation of the aorta; but as this vessel very frequently arises from one of the primitive iliac arteries, and is also so very small in proportion to the aorta, I shall consider it as one of its branches.

1. and 2. *ARTERIE PHRENICÆ* are two in number; they arise from the aorta on a level with the diaphragm, and pass upwards, outwards, and forwards to be distributed to that muscle: each divides into two branches; one of which runs forwards towards the anterior margin of the thorax, and anastomoses with the epigastric and internal mammary arteries; the other traverses the lateral margin of the thorax, and anastomoses with the inferior intercostal arteries. These arteries also send branches to the supra-renal capsules and crura of the diaphragm. The left sends some to the œsophagus, and the right to the termination of the vena cava.
3. *AXIS CÆLIACIA* is a very short trunk which arises from the aorta immediately after the phrenic arteries, and inclines downwards; it passes above the pancreas, is concealed by the lesser omentum, and has on either side the semilunar ganglia. It immediately gives off three principal branches, which supply the stomach, spleen, liver, duodenum, pancreas, and omentum.

- a. Arteria gastrica* inclines upwards and to the left side, to reach near the cardiac orifice of the stomach, where it divides between the laminae of the lesser omentum into the two following branches : —
- α. Arteria superior* passes upwards along the posterior surface of the œsophagus, and sends branches to it and the great end of the stomach, which anastomose with the œsophageal and splenic arteries.
- β. Arteria coronaria ventriculi* is the continuation of the vessel which passes along the lesser curvature of the stomach towards its pyloric orifice, sending off branches to it and the lesser omentum, and anastomosing with the superior pyloric artery, which is derived from the hepatic artery, and with the gastro-epiploic arteries which run along the convex edge of the stomach.
- b. Arteria hepatica* passes upwards and forwards towards the transverse fissure of the liver, where it terminates by dividing into the right and left hepatic arteries, which are distributed to the liver. In its course it lies in front of the vena porta, and to the left of the hepatic duct, and sends off —
- α. Arteria pylorica superior*, which passes to the posterior part of the pylorus, supplies it

with branches, and unites with the *coronaria ventriculi* along the lesser curvature of the stomach.

β. *Arteria gastro-duodenalis* passes above the pancreas, between it and the duodenum, and divides into —

a. *Arteria pancreatica duodenalis*, which supplies the pancreas and duodenum, and anastomoses at the root of the mesentery with the pancreatic arteries derived from the superior mesenteric artery.

b. *Arteria gastro-epiploica dextra* runs from right to left along the great curvature of the stomach, supplying it and the great omentum, and anastomosing with the *gastro-epiploica sinistra* derived from the splenic artery, and with branches of the *coronaria ventriculi*.

γ. *Arteria hepatica sinistra* is smaller than the following; it passes to the left lobe of the liver, and supplies it with numerous branches.

δ. *Arteria hepatica dextra* passes in a similar manner to the right lobe, in which it is expended, first having given off the

a. *Arteria cystica*. This small artery divides into two branches; one of which ramifies between the coats of the gall bladder, the other between it and the surface of the liver.

c. *Arteria splenica* passes outwards, backwards, and to the left side along the superior margin of the pancreas to the spleen, in which organ its ultimate branches terminate.

α. *Arteriæ pancreaticæ parvæ*, small and irregular branches which are distributed to the pancreas, and which anastomose with the *pancreatica duodenalis*.

β. *Arteria pancreatica magna* runs from left to right in the substance of the pancreas, in the direction of its duct; it also anastomoses with the *pancreatica duodenalis*.

γ. *Vasa brevia*, small branches which run a retrograde course from either the trunk of the splenic artery or from its terminal branches. They supply the great extremity of the stomach, and anastomose with the gastric artery and the *gastro-epiploica sinistra*.

δ. *Arteriæ splenicæ* are five or six in number, which enter the spleen and are lost in that viscus.

ε. *Arteria gastro-epiploica sinistra* is a retrograde branch, which runs from right to left along the great curvature of the stomach, sending branches to it and the great omentum, and anastomosing with the right *gastro-epiploic* artery.

4. **ARTERIA MESENTERICA SUPERIOR** arises a short distance below the cœliac axis from the anterior part of the aorta ; it passes between the pancreas and duodenum, enters the laminæ of the mesentery, and runs obliquely downwards to the right iliac fossa, forming a curve, the convexity of which looks towards the left iliac region.

a. *Arteria colica dextra* passes transversely to the centre of the ascending colon, and divides into two branches : the superior branch anastomoses with the right division of the *arteria colica media* ; the inferior branch with the ascending division of the ileo-colic artery.

b. *Arteria colica media* passes from the upper part of the artery to the transverse colon, and divides into a right and left branch. The right anastomoses with the ascending branch of the *colica dextra* ; the left with the *arteria colica sinistra*, a branch of the inferior mesenteric.

c. *Arteria ileo-colica* passes to the right iliac region, and divides into three orders of branches, the superior anastomoses with the inferior branch of the *colica dextra* ; the middle supplies the termination of the ileum, the cœcum and its vermiform appendix ; the inferior descends and anastomoses with the termination of the superior mesenteric artery itself.

From the arches formed by the arteries just described, ramusculi pass to supply the intestinal coats.

d. Arteriæ mesentericæ are from sixteen to twenty in number: they pass from the convex aspect of the artery, run between the laminæ of the mesentery, and anastomose with each other, forming a series of arches, from the convexity of which branches arise, which again unite, forming smaller arches; and after this method of anastomosis sometimes form as many as four arches before they enter the coats of the jejunum and ileum, to which intestines they are ultimately distributed.

5. *ARTERIÆ CAPSULARES*, two small arteries which arise from the aorta close to the superior mesenteric artery: they pass obliquely outwards to the supra-renal capsules, to which they are distributed; and anastomose with branches of the phrenic arteries.

6. *ARTERIÆ RENALES* pass from the aorta nearly at right angles, a little below the superior mesenteric artery: they terminate by minute ramifications in the cortical substance of the kidneys; and before entering these organs, each artery divides into four or five branches. The right renal artery is longer than the left, in consequence of the aorta being situated at the left side of the spine.

7. **ARTERIE SPERMATICÆ** arise from the anterior part of the aorta, a little below the renal arteries : each spermatic artery crosses the ureter, psoas muscle, and external iliac artery, and at the internal abdominal ring joins the spermatic chord, which conducts it to the testicle ; having given to the epididymis three or four branches, its ultimate distribution is to the tubular structure of the testicle, which it reaches by its terminal branches piercing the posterior part of the tunica albuginea.

In the female, these arteries, being distributed to the ovaries, do not pass out of the pelvis, but course backwards and inwards between the layers of the broad ligaments of the uterus ; branches being also sent to the round ligaments of that organ, and to the uterus itself.

8. **ARTERIA MESENTERICA INFERIOR** arises from the aorta a little before its termination, and passes obliquely downwards to the left side to reach the sigmoid flexure of the colon.

- a. *Arteria colica sinistra* passes in front of the left kidney, and anastomoses by an ascending branch with the *arteria colica media*, and by a descending branch with the sigmoid artery.
- b. *Arteria sigmoidea* passes transversely to supply the sigmoid flexure of the colon, and anastomoses with the descending branch of the *arteria colica sinistra*.

- c. Arteria hæmorrhoidalis superior* is the continued trunk; it passes between the laminæ of the meso-rectum to the middle of the sacrum, where it divides into two branches which run along the sides of the rectum, supplying this intestine, and anastomosing with each other, and with the middle hæmorrhoidal arteries, branches of the internal iliac artery. The terminal branches of this vessel anastomose at the anus with the external hæmorrhoidal arteries derived from the pudic.
9. *ARTERIÆ URETERICÆ*, small branches distributed to the ureters, which are derived from the aorta itself, and from the branches of this vessel which pass in the vicinity of these tubes.
10. *ARTERIÆ LUMBALES* are five in number on either side, and in size and direction are similar to the intercostal arteries. They divide into anterior and posterior branches: the anterior supply the *psoæ* and *quadrati lumborum* muscles; the posterior, the inferior part of the spinal chord and its membranes, the *vertebræ*, and the lumbar mass of muscles. They anastomose with the intercostal, ilio-lumbar, *circumflex ilii*, *epigastric*, and internal mammary arteries.
11. *ARTERIA SACRA MEDIA* in general arises from the bifurcation of the aorta, but often from the left primitive iliac artery. It passes along the middle

of the sacrum to the extremity of the os coccygis, and anastomoses with the lateral sacral and hæmorrhoidal arteries, supplying in its course the rectum and sacrum.

ARTERIÆ ILIACÆ PRIMITIVÆ,

diverge from the bifurcation of the aorta, and pass obliquely downwards and outwards to opposite the ilio-sacral symphyses, where they divide into the internal and external iliac arteries. The right primitive iliac artery is a little longer than the left, in consequence of the aorta lying towards the left side; both arteries are covered by the peritoneum, and are crossed at their bifurcation by the ureters. The right iliac artery is covered by the ileum as it is passing to enter the caput coli, and the left by the sigmoid flexure of the colon: neither artery gives off any trunk of importance, but small branches pass to the psoæ muscles and to the ureters.

ARTERIA ILIACA INTERNA,

runs tortuously downwards and backwards to the great sacro-sciatic notch, where it terminates by dividing into several branches; it lies deep in the pelvis, sending branches to the parts within this cavity, and also branches externally to supply the muscles situated upon the external part of the pelvis and to the organs of generation. It is ac-

accompanied by the internal iliac vein, which lies behind it, and in front it is crossed by the ureter. In the foetus this artery appears to be the continued trunk of the primitive iliac, both in its size and direction. At this period it passes forwards and downwards to reach the bladder, along the side of which viscus it turns upwards and inwards, and is thus conducted to the inner surface of the abdominal parietes; converging to its fellow of the opposite side, it continues its course upwards to the umbilicus, by which aperture both arteries escape from the abdomen. Coiling round the umbilical vein, they ultimately reach the placenta, in which organ they are lost.

1. **ARTERIA ILIO-LUMBALIS** passes across the ilio-sacral symphysis to the iliac fossa, running behind the psoas muscle and the external iliac vessels. It supplies the psoas and quadratus muscles by ascending branches; the iliacus internus muscle by descending branches; and the gluteal muscles by middle transverse branches which pass over the crest of the ileum. It anastomoses with the lumbar, epigastric, femoral, gluteal, and circumflex arteries.
2. **ARTERIA SACRI LATERALIS** passes downwards and inwards, lying upon the origins of the pyriformis muscle and the sacral nerves. It supplies the pyriformis muscle, the sacral plexus of nerves,

the rectum and the bladder; and anastomoses at the os coccygis with its fellow, and in its course downwards with the other sacral arteries.

3. **ARTERIA HÆMORRHOIDALIS MEDIA** in general arises from the pudic artery; it passes along the anterior and lateral part of the rectum, supplying it, the bladder, vesiculæ seminales, and prostate gland; and the uterus and vagina in the female: it anastomoses with the other hæmorrhoidal arteries, and with branches of the pudic artery.

4. **ARTERIE VESICALES** are two or three in number, which supply the bladder and the ureters, and are very uncertain in their origin; being either derived from the pudic, middle hæmorrhoidal, or the ischiadic arteries.

5. **ARTERIA UMBILICALIS** passes from the bifurcation of the primitive iliac artery to the side of the bladder, sending several branches to its lateral parietes, and ends in a ligamentous chord which marks the course of the hypogastric artery as it existed in foetal life.

3. **ARTERIA UTERINA** arises often from the pudic or middle hæmorrhoidal arteries: it is very small, and passes in a tortuous manner between the laminae of the broad ligament of the uterus to

that organ, which it supplies, together with the bladder and the vagina; and anastomoses with the artery of the opposite side, and with the spermatic artery.

7. *ARTERIA VAGINALIS* arises often from the pudic or middle hæmorrhoidal arteries, and runs forwards and inwards to reach the side of the vagina, supplying it, the bladder, and the rectum; and anastomoses with branches of the pudic artery.

8. *ARTERIA OBTURATORIA* arises in many instances from the epigastric artery; and as in such cases it holds important relations to the neck of a femoral hernial sac, its course under such circumstances shall be considered after the regular distribution of the artery is described. When regular, it arises from the internal iliac artery, and passes downwards and forwards to reach the upper part of the obturator foramen, through which it escapes from the pelvis; it is accompanied by the obturator nerve, but lies inferior to it. Whilst within the pelvis it sends branches to the bladder, lymphatic glands, psoas and obturator internus muscles, and to the obturator ligament; and without the pelvis, it supplies the obturator externus, adductores, quadratus femoris, and hamstring muscles. Its pelvic branches anastomose with the vesical and epigastric arte-

ries; and its femoral branches with the circumflex, pudic, femoral, and profunda arteries. When this artery arises from the epigastric, it passes downwards and inwards, crossing the femoral ring, and descends behind the ramus of the pubis to reach the upper part of the thyroid foramen. If a femoral hernia exists under such a circumstance, the artery must surround more than one half the neck of the sac.

9. **ARTERIA GLUTEA** is a very large but short trunk; it passes downwards, outwards, and backwards, and escapes from the pelvis through the sacro-sciatic notch, between its upper edge and the pyriformis muscle, and immediately divides into two branches.

a. *Arteria glutea superficialis* passes between the gluteus maximus and gluteus medius muscles, and divides into several branches which supply these muscles and the ilio-sacral ligaments, and anastomose with branches of the pudic and sciatic arteries.

b. *Arteria glutea profunda* runs in an arched direction forwards between the gluteus medius and gluteus minimus muscles, supplies these muscles, and anastomoses with the ilio-lumbar and circumflex ilii arteries by branches which pass towards the anterior superior spine of the ilium. It also supplies the capsular ligament

of the hip-joint by branches which pass downwards towards the great trochanter, and which anastomose with the external circumflex artery derived from the femoral; one or two branches are also sent into the substance of the ilium.

10. *ARTERIA ISCHIADICA* arises a little below the gluteal, and passes through the great sacro-sciatic notch between the pyriformis and superior gemellus muscles, and descends upon the posterior part of the thigh between the great trochanter and the tuberosity of the ischium, supplying the muscles in this situation.

a. Arteria coccygæi passes downwards, pierces the sacro-sciatic ligaments, supplying them, the gluteus maximus and levator ani muscles, and the rectum, and anastomoses with the lateral sacral, the pudic, and hæmorrhoidal arteries.

b. Arteria comes nervi ischiadici passes from the artery opposite the tuberosity of the ischium, and accompanies the sciatic nerve.

c. Arteriæ musculares, several large branches which supply the gluteus maximus and the hamstring muscles, also the small muscles upon the posterior part of the hip-joint, and anastomose with the branches of the profunda femoris and circumflex arteries.

11. **ARTERIA PUDICA** arises sometimes in common with the ischiadic artery, and passes out of the pelvis with it through the sciatic notch; it runs upon the posterior surface of the spinous process of the ischium, enters the pelvis through the lesser sciatic notch, and runs forwards and upwards along the inner surface of the tuber ischii and the rami of the ischium and pubes, passes between the laminæ of the suspensory ligament of the penis, runs along the dorsum of that organ, and is ultimately distributed to the corona glandis and prepuce. In the first part of its course, this artery lies behind the bladder and vesicula seminalis, and rests upon the pyriformis muscle; outside the pelvis it rests upon the spinous process of the ischium; at the tuberosity of the ischium it is more than an inch distant from its inferior edge, and is protected by the obturator fascia; in its ascent along the rami of the ischium and pubes it gradually becomes more superficial, and is protected by the falciform process of the great sacro-sciatic ligament and the obturator fascia.

a. Arteriæ hæmorrhoidales externæ, two or three small arteries which pass from the artery as it is in contact with the tuber ischii; they pierce the obturator fascia, and run imbedded in adipose tissue, to the side of the anus, and are distributed to its margin. They anastomose

with the gluteal, superior hæmorrhoidal, and middle hæmorrhoidal arteries.

- b. Arteria perinæa* pierces the obturator fascia, and runs upwards and forwards across the transverse muscle of the perinæum to the triangular space bounded by the erector penis and accelerator urinæ muscles. It is distributed to the dartos and skin covering the scrotum and perinæum, and anastomoses with the spermatic, femoral, and obturator arteries. In the female it is distributed to the labium.
- c. Arteria transversalis perinæi* pierces the obturator fascia, and runs along the transverse muscle of the perinæum; it is distributed to the parts between the anus and bulb, and anastomoses with the perinæal and hæmorrhoidal arteries.
- d. Arteria corporis bulbosi* passes from the pudic artery, as it is opposite the bulb of the urethra, horizontally inwards, running between the layers of the triangular ligament of the urethra. It sends a small branch to Cowper's glands, then enters the bulb and ramifies through the corpus spongiosum urethræ as far as the glans penis.
- e. Arteria corporis cavernosi penis* enters the root of the crus penis, runs through the centre of its corpus cavernosum, supplying its cells

and anastomosing with its fellow through the septum of these organs.

- f. *Arteria dorsalis penis* passes upwards between the crus penis and ramus of the pubes, and having pierced the suspensory ligament of the penis, runs forwards along its dorsum as far as the corona glandis, where it divides into branches which surround this part, supplying it, and also sending numerous branches to the prepuce: those branches sent to the glans penis anastomose with the arteries of the corpus spongiosum urethræ.

ARTERIA ILIACA EXTERNA,

extends from the bifurcation of the primitive iliac artery obliquely downwards and outwards to Poupart's ligament. The psoas muscle lies to its external side, and the external iliac vein lies at first posterior to the artery, but inclines to its inner side as the vessel descends, so that at Poupart's ligament the vein is situated on a level with the artery and to its inner side. The anterior crural nerve lies to the outer side of the artery, and is separated from it by fibres of the psoas muscle.

1. **ARTERIA EPIGASTRICA** arises from a quarter to half an inch above Poupart's ligament, sometimes on a level with this ligament, or even below it.

When it arises above Poupart's ligament, it invariably descends to get on a level with it, and then pursues its course upwards and inwards, lying between the fascia transversalis and the peritoneum : midway between the umbilicus and pubes it enters the sheath of the rectus muscle, and at the umbilicus anastomoses with the descending branches of the internal mammary artery from the subclavian. This artery is accompanied by two veins ; is placed at the inner side of the internal abdominal ring ; has the spermatic chord lying anterior to it, and the vas deferens hooking round it to arrive at the inferior fundus of the bladder.

a. Arteriæ spermaticæ pass to the chord, escape through the external abdominal ring, and anastomose with the spermatic arteries derived from the aorta.

b. Arteriæ musculares supply the muscles of the abdomen, and anastomose with the inferior intercostals, the internal mammary, superficial epigastric, and circumflex ilii arteries.

2. **ARTERIA CIRCUMFLEXA ILII** arises a little above Poupart's ligament from the external side of the artery, and taking the course of the ligament passes upwards and outwards towards the anterior superior spine of the ilium ; it then turns backwards along the crest of the ilium, and terminates

by anastomosing with the ilio-lumbar artery. It supplies some of the inguinal glands, the abdominal and glutæi muscles, and anastomoses with the lumbar, epigastric and gluteal arteries.

ARTERIA FEMORALIS,

extends from the inferior margin of Poupart's ligament obliquely downwards, backwards, and inwards to the junction of the middle third of the thigh with the inferior, at which point it pierces the tendon of the triceps magnus, and takes the name of popliteal artery. The femoral artery, therefore, only occupies the superior and middle third of the thigh. In the superior third of the thigh, the femoral artery first lies upon the psoas muscle, separated from it by the fascia iliaca, which passes underneath Poupart's ligament in this situation: it is next supported by cellular tissue, in which lie the profunda artery and vein, and which parts separate it from the pectineus and adductor brevis muscles. In the middle third of the thigh it rests upon the adductores longus and magnus: at first the femoral vein lies internal and on the same plane with the artery, but as the vessel descends it gradually gets behind it; the anterior crural nerve is external, separated from the artery by fibres of the psoas muscle. In the upper third of the thigh it is covered by the skin, superficial fascia, and fascia lata, and sometimes by one or two of the in-

guinal glands: in the middle third it is much deeper, and is covered, in addition to the parts enumerated, by the sartorius muscle, and by a strong fascia which passes from the adductores muscles to the vastus internus; the artery is also accompanied in this situation by the internal saphænus nerve, which lies anterior and external to it.

1. *ARTERIA EPIGASTRICA SUPERFICIALIS* arises half an inch below Poupart's ligament; passes through the fascia lata, or the cribriform fascia; turns over Poupart's ligament, and ascends, in the superficial fascia, upwards and inwards towards the umbilicus. It supplies the skin, superficial fascia, and inguinal glands, and anastomoses with the internal epigastric and mammary arteries.
2. *ARTERIE PUDENDÆ SUPERFICIALES* are two in number: the superior, which is also most superficial, passes upwards and inwards, and crosses the external abdominal ring to be distributed to the external organs of generation. The inferior passes downwards and inwards under cover of the fascia lata, and is distributed to the scrotum in the male and the labium in the female: it anastomoses with branches of the internal pudic artery.
3. *ARTERIA CIRCUMFLEX ILII SUPERFICIALIS* passes

from the femoral artery upwards and outwards parallel to Poupert's ligament, is covered only by the integuments which it supplies, and anastomoses with branches of the gluteal and external circumflex arteries.

4. **ARTERIA PROFUNDA FEMORIS** arises from the external and posterior aspect of the femoral artery, about one inch and a half or two inches below Poupert's ligament. It first runs outwards, but soon turns downwards and backwards, getting behind the femoral artery, and both vessels are separated from each other by their accompanying veins. The profunda artery is a vessel exclusively distributed to the thigh; whilst the femoral artery, from which it is derived, sends but few branches to this part, its branches being distributed to the leg.

a. Arteria circumflexa externa arises from the profunda soon after its origin, and passes outwards underneath the sartorius and rectus muscles: it soon divides into three sets of branches, the ascending of which supplies the sartorius, tensor vaginæ femoris, and glutæi muscles, and anastomoses with the gluteal and circumflex illi arteries: the middle passes deep, supplies the rectus, cruræus, and vastus externus muscles, and anastomoses with the internal circumflex, gluteal, and sciatic

arteries: the descending passes downwards along the anterior part of the thigh as far as the knee-joint, supplies the quadriceps extensor muscle, and anastomoses with the superior articular arteries from the popliteal, and the anastomotica magna artery from the femoral.

b. Arteria circumflexa interna passes backwards and inwards between the head of the femur and the lesser trochanter; supplies the pectineus, adductores, hamstring and glutæi muscles; also the fatty body of the hip-joint, the ligamentum teres, and head of the femur, by a branch which passes through the acetabular notch. The branches of this vessel anastomose with the obturator external circumflex, gluteal, sciatic, and perforating arteries.

c. Arteria perforans prima passes backwards between the pectineus and adductor brevis muscles, supplies these, and also the glutæus maximus and vastus externus muscles, and anastomoses with the gluteal, sciatic, and circumflex arteries.

d. Arteria perforans secunda passes through the adductores brevis and magnus muscles to the posterior part of the femur, supplying the muscles in this situation, and anastomosing with the sciatic, gluteal, circumflex, and the other perforating arteries. It sends off the medullary

artery of the femur, which enters the foramen in the linea aspera of that bone.

- e. Arteria perforans tertia* passes backwards through the adductor magnus, supplying the muscles upon the back part of the thigh, and anastomoses with the other other perforating arteries, and with branches from the popliteal artery.
5. **ARTERIA ANASTOMOTICA MAGNA** passes from the femoral artery, as it is about to become the popliteal, downwards and inwards, supplies the vastus internus and cruræus muscles, and anastomoses with the descending branches of the external circumflex artery of the hip-joint, and the internal articular arteries derived from the popliteal.

ARTERIA POPLITEA,

extends from the opening in the triceps muscle to the inferior border of the popliteus muscle, where it terminates by dividing into the anterior and posterior tibial arteries. It first lies upon the posterior inferior flat surface of the femur, next upon the posterior part of the knee-joint, and lastly upon the popliteus muscle. It traverses the popliteal region, running through it in a direction obliquely downwards and outwards; it is accompanied by the popliteal vein, which lies external and

ARTERIA TIBIALIS POSTICA,

extends from the division of the popliteal artery, at the inferior border of the popliteus muscle, obliquely downwards and inwards to midway between the os calcis and internal malleolus, where it terminates by dividing into the internal and external plantar arteries. It is placed between the superficial and deep layer of muscles upon the posterior part of the leg, and is bound down by the deep fascia in this situation. It lies upon the tibialis posticus in the first part of its course, next upon the flexor longus digitorum, and inferiorly it is only separated from the tibia by some cellular tissue. It is accompanied by two veins, one on either side, and the posterior tibial nerve, which lies to its fibular side. When it is passing the internal malleolus, it is accompanied by three tendons in addition to its veins and nerve. The following is the order in which these parts lie;—the tendons of the tibialis posticus and flexor digitorum communis muscles run close to the inner malleolus; a quarter of an inch behind is the artery, with a vein upon either side of it; a little behind these runs the posterior tibial nerve; and a half inch nearer the heel is the tendon of the flexor pollicis longus muscle.

1. **ARTERIE MUSCULARES**, small branches distributed to the popliteus, solæus, and gastrocnemii muscles.

2. **ARTERIA PERONÆA** arises from the posterior tibial artery an inch or more below the inferior border of the popliteus muscle, and runs obliquely downwards and outwards towards the external malleolus, where it terminates by dividing into the anterior and posterior peronæal arteries. The artery follows the direction of the fibula, and lies at first upon the tibialis posticus muscle, and next upon a groove in the interosseous margin of the fibula: it is covered for the upper part of its course by the solæus muscle.

a. *Arteria nutritia fibulæ* enters the foramen in the fibula, supplying the substance of the bone and its medullary membrane.

b. *Arteriæ musculares*, branches distributed to the peronæi and deep-seated muscles of the leg.

c. *Arteria peronæa anterior* passes forwards through the inferior interosseous space to reach the fore-part of the leg, sends branches to the peronæus tertius muscle, inclines towards the external malleolus, and there anastomoses with the external malleolar artery, a branch of the anterior tibial artery.

d. *Arteria peronæa posterior* continues in the original course of the peronæal artery behind the fibula to the external side of the os calcis, supplying the peronæi muscles, and anastomosing with the posterior tibial, external plantar, and anterior tibial arteries.

3. **ARTERIA NUTRITIA TIBIÆ** passes forwards to the tibia, enters the foramen in the posterior part of this bone, and supplies its substance and its medullary membrane.
4. **ARTERIA PLANTARIS INTERNA** passes, from the division of the posterior tibial artery, forwards along the internal side of the tarsus, to the great toe, supplying its muscles and integuments, and anastomosing with its digital arteries and with branches derived from the anterior tibial artery.
5. **ARTERIA PLANTARIS EXTERNA** appears to be the continued trunk of the posterior tibial. It passes obliquely outwards and forwards to reach the base of the metatarsal bone of the little toe, and then alters its course by running from this point inwards across the foot to reach the cleft between the metatarsal bones of the first and second toes, where it terminates by anastomosing with the anterior tibial artery, thus forming the plantar arch of arteries.

PLANTAR ARCH.

The convexity of this arch, thus formed by the external plantar artery, and the terminal branch of the anterior tibial artery, called *arteria communicans*, is directed forwards and outwards, the concavity looking in the opposite direction. From it branches

proceed in various directions; some pass backwards to supply the muscles, fascia, and cellular tissue in the sole of the foot. From its superior surface arise —

1. **ARTERIE PERFORANTES**, three or four in number, which pass upwards between the metatarsal bones, through the dorsal interossei muscles, to reach the dorsum of the foot, where they anastomose with the metatarsal arteries.
2. **ARTERIE DIGITALES** are four in number: they pass from the convexity of the arch forwards, supplying both sides of the three outer toes, and the outerside of the second toe; both sides of the great toe, and the inner side of the second toe, being supplied by the *arteria pollicis* from the anterior tibial artery. They are distributed as follows: —
 - a. Passes along the outer side of the little toe, and anastomoses with a branch of the second.
 - b. Passes along the metatarsal space to the cleft between the fourth and little toe, where it divides into two branches which supply their opposed sides; the outer branch anastomosing with a. the first digital artery, the inner with a branch of, c. the third digital artery.
 - c. Runs to the cleft between the third and fourth toes, divides into two branches which run along their opposed sides, and anastomose at either

extremity of the opposite branches in a manner similar to the second.

- d. Runs to the cleft between the second and third toes, and divides into two branches which follow the same mode of distribution.

ARTERIA TIBIALIS ANTICA,

passes from the division of the popliteal artery through the superior interosseous space to reach the anterior surface of the interosseous ligament, along which it runs to the bend of the ankle; passing this joint, it runs upon the upper surface of the tarsus to the cleft between the first and second metatarsal bones, where it communicates by one of its terminal branches with the external plantar artery, to perfect the plantar arch. In reaching the anterior aspect of the leg, it passes through the tibialis posticus muscle; it next rests, for its two superior thirds, upon the interosseous ligament; and for the rest of its course is supported by the anterior surface of the tibia and the tarsus. In the upper part of its course it lies deep between the tibialis anticus and extensor longus digitorum muscles; lower down it lies between the tibialis anticus and extensor pollicis muscles; and at its inferior third it is very superficial, and is placed between the tendons of the extensor pollicis and extensor digitorum muscles. This artery is accompanied by two

veins, one lying anterior, the other posterior, and also by the anterior tibial nerve, which lies to its outer side: it is deeply situated superiorly, but as it descends it becomes superficial, and at the inferior part of its course it is covered only by the integuments and fascia of the leg.

1. ARTERIÆ MUSCULARES, small branches sent to the tibialis posticus muscle and the extensor muscles upon the anterior part of the leg.

2. ARTERIA RECURRENS passes upwards through the fibres of the tibialis anticus muscle, sending branches to it and the peronæus longus muscle, as the vessel is reaching the fore-part of the knee-joint. It anastomoses with the inferior articular arteries, but chiefly with the external.

3. ARTERIA MALLEOLARIS INTERNA passes from the artery, a little above the ankle joint, and runs to the internal malleolus, beneath the tendon of the tibialis anticus muscle. It supplies the lower and inner extremity of the tibia, the internal lateral ligament and synovial membrane of the articulation, and anastomoses with branches of the posterior tibial artery.

4. ARTERIA MALLEOLARIS EXTERNA passes outwards above the ankle joint, and runs under the tendon of the extensor digitorum communis muscle. It supplies the lower extremities of the tibia

and fibula, their connecting ligaments, and the external lateral ligaments of the ankle joint; and anastomoses with the posterior peronæal artery, and with branches of the tarsal artery.

5. **ARTERIA TARSII** supplies the extensor digitorum brevis muscle, the tarsal bones and their synovial ligaments, and anastomoses with branches of the plantar and metatarsal arteries.
6. **ARTERIA METATARSII** passes outwards and forwards over the metatarsal articulations, supplying them with branches, and forming an arch from which proceed three branches which run along the external interosseous spaces supplying the interossei muscles, and anastomosing with the perforating arteries from the plantar arch.
7. **ARTERIA POLLICIS** passes to the cleft between the first and second toes, and divides into two branches. The inner branch passes along the inner side of the great toe, and the external divides into two, which supply the opposed sides of the great and second toes. These branches complete the arterial supply of the toes, and anastomose in a similar manner to the other digital arteries derived from the plantar arch.
8. **ARTERIA COMMUNICANS** passes between the metatarsal bones of the great and second toes to unite with the terminal branch of the external plantar artery, and thus perfecting the plantar arch,

OPERATIONS

FOR SECURING THE SEVERAL ARTERIAL TRUNKS.

RADIAL ARTERY,

As it runs on the back of the hand after it has passed the extensor tendons of the thumb.

Place the hand between pronation and supination, but nearer the former position; abduct the thumb from the fingers, which will sufficiently render evident the tendon of the extensor secundi internodii pollicis muscle, along the ulnar edge of which an incision about one inch and a half long is to be made, which should divide the skin and superficial fascia. In this incision the commencement of the cephalic vein and branches of the musculo-spiral nerve will present themselves; the vein must be drawn to the radial side of the wound, and the nerves to the other. By tearing through the cellular tissue, the tendon of the extensor secundi internodii pollicis will be found to cross the artery obliquely, and the vessel to be protected by a fascia, upon dividing which it can readily be secured at either side of the tendon.

RADIAL ARTERY,

At the inferior third of the fore-arm.

Place the hand supine, and extend the fore-arm sufficiently so as to allow the dorsum of the hand to rest upon the operating table. Feel for the tendons of the extensor carpi radialis longus muscle, which lies upon the external edge of the radius, and of the flexor carpi radialis muscle. Parallel to and between the tendons of both muscles make an incision two inches and a half in length, which should divide the skin and superficial fascia. Some small veins must be divided. Clear away the cellular tissue, avoiding some branches of the musculo-spiral nerve which lie to the radial edge of the wound, when the deep fascia will be brought into view; upon dividing which, the artery, with its venæ comites lying upon either side of it, will be exposed. The needle should be passed round the artery from its radial to its ulnar side.

RADIAL ARTERY,

At the middle third of the fore-arm.

Supinate the hand, and extend the fore-arm. Make an incision three inches in length, parallel to the ulnar margin of the supinator radii longus

muscle, avoiding as much as possible the branches of the median vein. This should divide the skin and superficial fascia. The proper fascia of the extremity will now be exposed, which should be divided upon a director to the same extent as the external incision, and the ulnar edge of the supinator radii longus muscle brought into view. This muscle being retracted to the radial side of the wound, a second fascia (the deep fascia of the fore-arm) will be seen, which must be divided to a similar extent, when the vessel with its venæ comites and the musculo-spiral nerve will be exposed. The veins do not lie at either side of the artery as in the former operation, but are situated anteriorly and posteriorly, so that the first vessel we meet with after dividing the fascia is one of the venæ comites. The musculo-spiral nerve lies to the radial side of the wound, behind the artery, and under cover of the tendon of the extensor carpi radialis longus muscle. Separate the venæ comites from the artery, and pass the needle from the radial to the ulnar side of the vessel.

In a thin patient the pulsation of the artery can be felt in this situation, but in a muscular subject the artery is overlapped by the muscle, and the incision in such a case should be proportionally longer.

RADIAL ARTERY,

At the superior third of the fore-arm.

Place the extremity as in the last operation. Draw a transverse line from one condyle of the humerus to the other along the anterior aspect of the elbow joint: divide this line into three equal parts; and at the point of junction of the middle third with the external or radial third, make an incision three inches in length obliquely downwards and outwards, through the skin and superficial fascia, taking care to avoid the cephalic vein or any branches of the median which lie in our way. By next dividing the cellular membrane, the ulnar edge of the supinator radii longus muscle will be exposed, and must be separated from the pronator radii teres muscle by drawing it to the radial side of the wound, when the deep fascia of the fore-arm will be seen; upon dividing which to the same extent as the external incision upon a director, the artery with its venæ comites will be brought into view. The venæ comites hold the same relation to the artery as in the last operation, and the musculo-spiral nerve lies behind it and to its radial side. After separating the venæ comites, the needle is to be passed from the radial to the ulnar side of the vessel.

ULNAR ARTERY,

At the inferior third of the fore-arm.

Place the extremity in the same position as has been directed for cutting down upon the radial artery in its inferior third. Ascertain the situation of the tendon of the flexor carpi ulnaris by tracing it from its insertion into the os pisiforme upwards, and make an incision through the skin and superficial fascia two inches in length parallel to it, and a few lines to its radial margin. The deep fascia will be then exposed binding down the artery, its venæ comites, and the ulnar nerve. This must next be divided upon a director, and the venæ comites separated from the artery. The needle must be passed around the vessel from its ulnar to its radial side, thus protecting the ulnar nerve, which lies close to the artery, along its ulnar side and rather behind it.*

* Although I have described this operation as the most distal one to be attempted upon the ulnar artery, yet, under certain circumstances, this vessel can be secured after it has passed the os pisiforme, an inch or more of the vessel lying obliquely in the palm of the hand before making its turn to form the superficial palmar arch. A case occurred to me of false aneurism of the vessel in this situation, produced by a wound. The patient was a muscular labouring man, the integuments of his palm very thick, and the tumor the size

ULNAR ARTERY,

At the middle third of the fore-arm.

Place the arm as in the last operation, and make an incision from two to three inches in length parallel to the flexor carpi ulnaris muscle and to its radial side, by which divide the skin and superficial fascia: the deep fascia of the arm is next to be divided upon a director, when the radial edge of the muscle will be found to lie in contact and parallel to the ulnar margin of the flexor digitorum sublimis. Separate these muscles from each other by tearing through the cellular tissue which connects them with the handle of the knife, when the artery with its venæ comites and the ulnar nerve will be brought into view. The nerve lying anterior and to the ulnar side of the vessel and the venæ comites at either side of it, draw the nerve and flexor carpi ulnaris to the ulnar edge of the wound, separate the venæ comites from the artery, and pass the needle from the ulnar to the radial side.

of a walnut: upon cutting into it, I readily recognised the artery at the bottom of the incision, with a small oval opening upon its anterior surface; and passed the needle with little difficulty under it, tying the vessel above and below its wounded part.

ULNAR ARTERY,

At the upper third of the fore-arm, near to the bend of the elbow.

Abduct the extremity from the trunk, and extend the fore-arm ; supinate the hand ; draw a line from the most prominent point of the internal condyle downwards to the os pisiforme. Two inches below the condyle, and corresponding to the line directed, make an incision downwards three inches in length, which should divide the skin and superficial fascia. The proper fascia of the arm, which is here very dense, and from which the muscles underneath partly take their origin, must next be divided upon a director, and the opposed edges of the flexor carpi ulnaris and flexor digitorum communis will be seen separated from each other by an intermuscular septum : these muscles must next be separated from each other by dividing the fleshy attachments which the flexor digitorum sublimis has to the septum, and by tearing through some cellular tissue. The ulnar nerve will now be seen, and is to be drawn to the ulnar side of the wound, and the handle of the knife passed horizontally towards the radius between the flexor sublimis and flexor profundus muscles ;—the artery with its venæ comites will be found lying upon the latter muscle, and the needle is to be passed around the vessel from the ulnar to the radial side.

BRACHIAL ARTERY,

At the bend of the arm.

Place the extremity as in the last operation : ascertain the tendon of the biceps muscle as it is passing over the anterior aspect of the elbow-joint to its insertion, which can readily be done by making the patient bend the fore-arm. Trace the tendon to the ulnar edge of the muscle, and make an incision along it upwards for three inches, dividing the skin and superficial fascia, and avoiding some branches of the internal cutaneous nerve and the median Basilic vein. The fascia which is sent off from the biceps tendon to the inner condyle will next present itself covering the artery : this is to be divided upon a director to the extent of the external incision, when the artery will be exposed with its venæ comites — one lying anterior, the other posterior to the vessel — having the tendon of the biceps to its ulnar side, and the radial edge of the pronator teres to its radial side ; with the ulnar nerve lying close to the artery and to its ulnar side. Separate the venæ comites, and pass the needle around the vessel from its ulnar to its radial side.

BRACHIAL ARTERY,

In the middle third of the arm.

Place the extremity as in the last operation, and

ascertain the ulnar edge of the belly of the biceps muscle, parallel to which make an incision through the skin and superficial fascia for the extent of three inches : the proper fascia of the arm will now be seen, and is to be divided to the same extent, avoiding the branches of the internal cutaneous nerve, when the ulnar edge of the biceps muscle will be brought into view, and is to be retracted outwards. By removing some cellular tissue, the artery with its venæ comites will now be exposed, with the median nerve, lying superficial and to its internal or ulnar side. By moderately flexing the fore-arm, the vessels and nerve will be relaxed, and the artery easily separated from its venæ comites. The needle is to be passed around the vessel from the ulnar to the radial side, keeping the convexity towards the nerve.

BRACHIAL ARTERY,

In the upper part of its course near to the axilla.

Place the patient in the horizontal position ; abduct the arm from the trunk, so that it will form an obtuse angle with it ; also supinate the hand : mark the boundaries of the axilla, and commence an incision at the centre of its inferior part, in the direction of a line drawn from this point to the centre of the anterior part of the elbow-joint : the incision, three inches in length, must divide the

skin and superficial fascia ; and the basilic vein and internal cutaneous nerve, which lie superficial to the artery, must be avoided. The proper fascia of the arm is next to be divided upon a director to the extent of the external incision. By now flexing the fore-arm, as recommended in the last operation, the vessels and nerves will be relaxed, and the artery with its venæ comites will be found. Separate the artery from the nerves and its venæ comites, by tearing through the cellular tissue connecting them, and pass the needle from the ulnar to the radial side of the vessel.

AXILLARY ARTERY,

At the lower third of the axilla.

Having shaved the hair from the axilla, place the patient in the recumbent posture. Abduct the arm from the side, and raise it upwards, first rotating it outwards. Feel for the head of the os humeri, and, corresponding to it, make an incision downwards two inches and a half in length, commencing at the centre of the axilla and terminating at the tendons of the latissimus dorsi and teres major muscles. This should divide the skin and fascia of the axilla, when the axillary vein and median nerve will present themselves. Now relax the parts by gently flexing the fore-arm, and sepa-

rate the vein from the nerve, by drawing the former to the ulnar side of the wound, and the latter to the radial side, when the artery with its venæ comites will be found lying behind and between them : cautiously detach the artery from the surrounding parts, and pass the needle around it from the ulnar to the radial side, thus protecting the axillary vein.

AXILLARY ARTERY,

In the centre of the axilla, or as it covered by the tendon of the pectoralis minor muscle.

Abduct the arm from the trunk and extend the fore-arm ; feel for the cellular interval which separates the edges of the great pectoral and deltoid muscles, corresponding to which make an incision downwards for three inches, dividing the skin and superficial fascia, and avoiding the cephalic vein and the thoracica-acromialis artery, by drawing them inwards with the edge of the great pectoral muscle ; continue to separate the muscles by dividing their cellular connection, until the tendon of the lesser pectoral muscle is brought into view as it is crossing the axilla to its insertion. Pass a director under it, and divide it : now relax the nerves and vessels in the axilla by bringing the arm towards the side ; separate the artery from the surrounding parts, and

pass the needle around it from within outwards, avoiding the axillary vein, which lies to its inner side.

This operation upon the dead subject is not difficult to perform ; but in the living subject, I doubt how far its performance or that of the next operation would be preferable to securing the subclavian artery in the third division of its course.

AXILLARY ARTERY,

At the upper third of the axilla immediately below the clavicle.

Place the patient reclining upon a low-backed chair, abduct the arm from the trunk, and commence an incision an inch external to the sternal end of the clavicle, and at its inferior border, which must be carried outwards to within an inch of the acromion process, cutting through the skin, superficial fascia, and some of the fibres of the platysma-myoides muscle. The clavicular portion of the great pectoral muscle will now be exposed, and must be detached from its connection to that bone for the extent of the external incision, taking care to avoid the cephalic vein which lies at its external margin : next remove some cellular tissue, when a dense fascia will present itself, and which must be cautiously divided upon a director ; immediately

under which will be seen the axillary vein : approximate the arm to the side, thus relaxing the vessels, and draw the vein downwards and inwards towards the sternum, insinuate the needle between the vein and artery, keeping its convexity towards the former, and pass it round the vessel from below upwards.

SUBCLAVIAN ARTERY,

After it has passed the scalenus anticus muscle.

Place the patient upon a low chair with the shoulders moderately raised ; make your assistant depress the shoulder, and divide the integuments by an incision which should correspond to the upper edge of the clavicle, and extend from the upper margin of the sterno-mastoid muscle to the anterior margin of the trapezius muscle. The platysma-myoides muscle and superficial fascia must next be cautiously divided upon a director to the extent of the external wound, taking care to avoid the external jugular vein, which generally presents itself near the outer termination of our incision, but which is sometimes nearer its trachial end. This vessel can be drawn towards the side it inclines to, and need not in most cases be divided ; but should it interfere much with the future steps of the operation, it had better be tied with two fine ligatures, and divided between them.

Some loose cellular tissue must next be lacerated with the handle of the knife, when the posterior belly of the omo-hyoid muscle, enclosed in a duplicature of the deep cervical fascia, will be seen. This fascia must next be divided, which in general can be effected with the nail or handle of the knife; but it is sometimes so dense as to require to be cut upon a director. The omo-hyoid muscle should now be drawn upwards and outwards, or it may be cut across, and the external edge of the anterior scalenus muscle brought into view or ascertained by the finger of the operator, along which it is to be passed downwards towards its insertion into the first rib, when the artery must be met with as it is passing from under the muscle. It will be recognised by its pulsation or resistance. The vessel is next to be gently insulated from the surrounding parts, which will be found to hold the following relations to it, *viz.* the brachial plexus lying to its superior and external side, and the subclavian vein anteriorly and inferiorly, and the needle passed around it from before and below backwards and upwards, unless the clavicle be too prominent, when it can be passed in the opposite direction, avoiding the subclavian vein.

SUBCLAVIAN ARTERY,

As it lies under the anterior scalenus muscle.

The steps of this operation differ but little from

the preceding. The patient is to be placed in the same position, and the external incision made in the same direction; but its internal extremity or commencement must be begun at the sternal portion of the sterno-mastoid muscle, the clavicular attachment of which is to be separated from the clavicle upon a director passed underneath it from without inwards. Having divided the deep cervical fascia in the manner already directed, and exposed the anterior scalenus muscle, a director is to be passed under it at its external edge, keeping it in close contact with its posterior surface, and the muscle divided with a probe-pointed bistoury for its two external thirds; thus protecting the phrenic nerve by leaving uninjured the internal third of the muscle, along the trachial margin of which the nerve runs.* The needle is to be passed around the vessel as recommended in the last operation, and the same precautions used with respect to the surrounding parts.

* I have never seen a deviation in the course of the phrenic nerve upon the anterior scalenus muscle in this part of the neck; it has invariably, in all the subjects I have examined passed upon its anterior aspect, and close to its trachial margin. When the manner in which it is conducted to the diaphragm by the pericardium is considered, and that it has to reach this part from the neck, it is difficult to imagine how it could pursue any other course.

RIGHT SUBCLAVIAN ARTERY,

At the trachial margin of the anterior scalenus muscle.

Place the patient as recommended in the two last operations, and make an incision from three to four inches in length outwards and parallel to the clavicle, commencing it at the inner edge of the sternal attachment of the sterno-mastoid muscle. Make a second incision along the anterior margin of this muscle two inches in length from above downwards, which should terminate at the inner extremity of the first; in both divisions divide the skin and superficial fascia, and dissect the angular flap thus formed, so that it can be turned upwards and outwards. The deep fascia of the neck is next to be cautiously divided upon a director, and some of the thyroid veins, which will be found descending upon its anterior surface, protected as much as possible. The external edges of the sterno-hyoid and sterno-thyroid muscles will now present themselves, and must be drawn inwards towards the trachea, when, by cautiously tearing through some cellular tissue, the trunk of the primitive carotid artery will be exposed: by passing the index finger along this vessel to its origin, it will be conducted to the subclavian artery at the point where it is given off from the arteria innominata. The artery in this

situation is surrounded by many important parts : the vagus nerve, the anterior branches of the inferior cervical branches of the sympathetic nerve, and the phrenic nerve, cross it anteriorly : the sympathetic and recurrent laryngeal nerves pass posterior to it ; the subclavian vein lies upon its anterior surface, and when distended conceals the artery ; and the pleura is in contact with it superiorly. In consequence of the projection of the clavicle, the needle can most readily be passed around the vessel from above, downwards and forwards, and must be kept in close apposition with it in order to avoid wounding the pleura.*

ARTERIA INNOMINATA.

The patient should be placed upon a table with the shoulders raised and the head thrown backwards ; which movement will draw the artery from the thorax towards the neck.

Two incisions, as recommended in the preceding operation, are to be made through the skin and superficial fascia, and the flap turned upwards and out-

* Upon the left side, an operation upon the subclavian artery in this part of its course should never be attempted. Added to the straight course the artery pursues from its origin, and the difficulty of securing it in a ligature in consequence, it lies deep in the thorax, and is connected to important parts, which the most careful operator could not avoid wounding.

wards. The sternal and clavicular attachments of the sterno-mastoid muscle are to be divided upon a director; also the deep cervical fascia and the sterno-hyoid and sterno-thyroid muscles. The carotid artery and internal jugular vein will next be brought into view, and the finger is to be passed along the former vessel to the arteria innominata, around which the needle is to be passed from behind forwards.*

PRIMITIVE CAROTID ARTERY,

At the anterior inferior triangle of the neck, or below the omo-hyoid muscle.

Place the patient in the recumbent posture, with the shoulders moderately raised. Ascertain the anterior margin of the sterno-mastoid muscle, by making the patient turn the head to the side opposite that to be operated upon. Make an incision three inches in length, or from that to three inches and a half, parallel to the anterior margin of the sterno-mastoid muscle, commencing immediately

* This artery has been operated upon in the living subject. It was first tied by Dr. Mott, of New York, with a success which should warrant a surgeon to perform the operation when a case demanded it. It is not a difficult operation in the dead subject; and when the artery is exposed, by allowing the head to incline a little forwards, the surrounding vessels and nerves can be easily separated from it.

above its sternal attachment. This should divide the skin and superficial fascia. Draw outwards the sterno-mastoid muscle, and with it any small veins which present themselves, and divide upon a director the deep cervical fascia. The sterno-hyoid and sterno-thyroid muscles, together with the branches of the descendens noni nerve, are to be drawn inwards towards the trachea, when the anterior surface of the sheath of the carotid vessels will be fully exposed. This is next to be laid open upon a director to the extent of half an inch, when the internal jugular vein will present itself, lying to the outer side of the artery and partly covering it. The vagus nerve, which is also contained in the sheath, lies behind, and between the artery and vein. The needle must be passed from without inwards, thus keeping its convexity to the vein; and before tying the ligature, the vagus nerve should be ascertained not to be included within it.

PRIMITIVE CAROTID ARTERY,

At the superior anterior triangle of the neck, or above the omo-hyoid muscle.

Place the patient in the same manner as recommended in the last operation, and make an incision from three to four inches in length, commencing

a little below the angle of the inferior maxilla, and terminating at the side of the crycoid cartilage: this should divide the skin and platisma-myoides muscle, when the superficial fascia will be exposed, which must be divided to the extent of the external incision, and upon a director, as in this part of the neck it is intimately adherent to the sheath of the carotid vessels. When the sheath is thus fully exposed, the descendens noni nerve, which lies upon its anterior and outer part, is to be drawn, with the inner edge of the sterno-mastoid muscle, outwards, and the inner edge of the wound drawn towards the larynx. The sheath must now be opened for half an inch or more, and the needle passed around the artery from without inwards. The vessels and the vagus nerve hold the same relations to each other as in the inferior part of the neck, but are more superficially situated.

EXTERNAL CAROTID ARTERY,

Near to its origin.

Make an incision similar in length and direction to that recommended in the last operation: divide the parts in the same order and with the same caution. Having exposed the tendon of the digastric and stylo-hyoid muscles, and removed some cellular tissue which connects them to the inferior

part of the parotid gland, depress them, when the artery will be brought into view. The lingual nerve crosses the vessel inferiorly, and can readily be avoided: pass the needle from below upwards.

The propriety of this operation is doubtful, in consequence of the numerous branches the external carotid gives off, and the very small portion of vessel which lies between each branch; thus preventing the formation of an internal coagulum.

SUPERIOR THYROID ARTERY.

This artery can easily be secured by making an incision from the os hyoides obliquely downwards and outwards towards the sterno-mastoid muscle, for two inches: this should divide the skin, platysma-myoides, and superficial fascia. By removing a little cellular tissue, the sheath of the carotid vessel will be exposed, and is to be drawn outwards, when the superior thyroid artery will be seen passing below the os hyoides, in an arched manner, towards the thyroid gland. The superior laryngeal nerve, which takes nearly the same direction as the artery, and which lies behind it, can easily be protected from being included in the ligature which is to be passed around the vessel from below upwards.

INFERIOR THYROID ARTERY.

This operation is attended with many difficulties, in consequence of its great depth, and the parts with which it is connected. It can, however, be secured by making an incision similar to that recommended for securing the primitive carotid artery in the inferior part of its course. When the sheath of the carotid vessels is exposed, it is to be drawn outwards, together with the sympathetic nerve which lies anterior to the artery, and the needle is to be passed from without inwards, avoiding the recurrent laryngeal nerve, which pursues the direction of the vessel lying anterior to it and to its trachial side.*

LINGUAL ARTERY.

Place the patient upon a chair, with the head slightly inclined backwards, and turned to the op-

* The thyroid arteries have been recommended to be secured in enlargements of the thyroid gland, with the view of cutting off its supply of blood. The superior thyroid arteries can readily be secured; and in recorded cases, much benefit was derived from such treatment: but I question how far, in such cases, it would be prudent to cut down upon the inferior thyroid arteries; or whether the advantages to be anticipated from such a proceeding would justify the surgeon in making this deep, tedious, and dangerous dissection.

posite side. Feel for the great cornu of the os hyoides, above which the artery passes nearly parallel; make an incision from two three inches in length, commencing half an inch below the symphysis of the chin, and inclining obliquely downwards and outwards, so as to cross the cornu of the os hyoides, and terminate at the anterior edge of the sterno-mastoid muscle: this should divide the skin, platysma-myoides, and superficial fascia. The cellular tissue is now to be torn through, until the tendon of the digastric muscle and lingual nerve are brought into view; these run superior to the artery, and are to be carefully separated from it, and the needle passed round the vessel from above downwards.*

* This operation has been recommended where the ranine artery has been wounded in cases of dividing the frænum linguæ, and where the ordinary methods of restraining hæmorrhage have failed; also previous to removing portions of the tongue, or morbid growths connected with that organ. Respecting the propriety of this operation under such circumstances, I heard Sir Astley Cooper express himself, a few months since, in strong terms, in consequence of the certainty with which it was found from the regularity of its course, added to the few parts covering it, and the artery of one side confining its distribution to the corresponding half of the tongue.

OPERATIONS

FOR SECURING THE ARTERIES OF THE LOWER EXTREMITY.

ANTERIOR TIBIAL ARTERY,

As it lies upon the dorsum of the foot.

EXTEND the foot upon the leg, and support the heel ; ascertain the tendon of the extensor pollicis proprius muscle, and make an incision two inches in length along its fibular edge, dividing the skin and superficial fascia. Tear through the cellular tissue between this tendon and the first tendon of the extensor digitorum longus, and upon separating both, the artery will be seen with the first tendon of the extensor digitorum brevis lying to its outer side. The terminal branches of the fibular nerve are liable to be wounded in the first incision ; and in passing the needle round the artery from without inwards, a branch of the anterior tibial nerve, which lies close to the artery, is to be avoided.*

* The artery in this situation seldom demands the attention of the operating surgeon, except in case of its being wounded, when it can be cut down upon, or the wound enlarged in the direction given, and the vessel secured with two ligatures.

ANTERIOR TIBIAL ARTERY,

Above the ankle joint.

First extend the foot; ascertain the course of the tendon of the extensor pollicis proprius muscle, and make an incision three inches in length along its fibular margin, dividing the skin and superficial fascia. The proper fascia of the leg will now be exposed, which is to be divided upon a director to the same extent as the first incision. Now flex the ankle joint, which will relieve the tendons passing over it, and separate the tendons of the extensor pollicis proprius and extensor digitorum communis, by drawing the former towards the tibial, and the latter towards the fibular side of the wound: tear through some cellular tissue; when the artery, with its venæ comites, will be exposed; separate the artery from the veins, and pass the needle around it from without inwards.

ANTERIOR TIBIAL ARTERY,

In the upper third of the leg.

From the centre of a line drawn from the spine of the tibia to the head of the fibula, commence an incision, which must extend downwards, towards the centre of the ankle joint, for five inches, dividing

the skin and superficial fascia. The proper fascia of the leg will be now exposed, and is to be divided to the same extent; and the intermuscular septum common to the tibialis anticus muscle internally, and the extensor digitorum communis and extensor pollicis proprius muscles externally, is to be ascertained by alternately flexing and extending the ankle joint; and the upper fibres of the extensor digitorum communis are to be separated from it; when with the finger or handle of the knife, the further separation of this muscle and the extensor pollicis proprius from the tibialis anticus can be effected. The interosseous ligament will now be exposed, with the artery, its venæ comites, and the anterior tibial nerve resting upon it. The nerve and one of the veins lie anterior to the artery, the other posterior to it; separate these from the vessel, and pass the needle around it from without inwards.*

POSTERIOR TIBIAL ARTERY,

As it passes behind the internal malleolus.

Place the patient in the recumbent position, or sitting upon a chair. Moderately extend the extremity, and allow it to rest upon its outer side.

* In most anatomical works, the venæ comites are stated to be at either side of the artery in this situation; but the relative position just stated will be found to be correct.

Make an incision two inches and a half in length through the skin and superficial fascia, commencing at the inner border of the tendo Achillis, and terminating near the centre of the fossa between the heel and inner ankle, but a little nearer to the malleolus. The deep fascia, which will now be exposed, must be divided upon a director, and the artery with its venæ comites will be brought into view. Immediately behind the malleolus lie the tendons of the flexor digitorum communis and tibialis anticus muscles; next to these, the artery with its veins; a little more external, the posterior tibial nerve; and half an inch nearer the heel, the tendon of the flexor pollicis proprius. Gently extend the foot, which will relax the parts passing behind the malleolus; separate the artery from its veins, and pass the needle round it from the heel towards the ankle, in order to protect the nerve.

POSTERIOR TIBIAL ARTERY,

In the middle of the leg.

Place the patient in the horizontal position; flex the leg, extend the foot, and place the extremity upon its outer side. Make an incision from five to six inches in length, parallel to the inner edge of the tibia, but a little posterior to it, dividing the skin and superficial fascia, and avoiding the internal saphena vein. The inner margin of the gastro-

nemius muscle will now present itself, which is to be turned aside; and having thus exposed the attachment of the solæus muscle to the tibia, a director is to be passed beneath it, and the muscle freely divided upon it. The deep fascia of the leg is next to be divided in a similar manner, when the artery with its venæ comites will be found resting upon the tibialis posticus muscle, and about midway between the tibia and fibula, or from three quarters of an inch to an inch distant from the inner margin of the tibia. The needle is to be passed around the vessel from without inwards, to avoid the posterior tibial nerve, first separating the artery from its venæ comites.*

POSTERIOR TIBIAL ARTERY,

In the upper third of the leg.

Upon a line drawn from the centre of the popliteal space to midway between the internal malleolus and tendo Achillis; make an incision five inches in length, commencing a little below the bend of the knee-joint, dividing the skin and superficial fascia. The gastrocnemius and solæus muscles are next to be divided separately, in the same direction, and for

* When the solæus muscle is exposed by the directions given in this operation, the vessel can be much easier got at by cutting directly down upon the artery through the fibres of the solæus.

the same extent, until the deep fascia of the leg is brought into view ; upon dividing which, the artery with its venæ comites, and the posterior tibial nerve, will be found resting upon the tibialis posticus muscle. Flex the leg, draw the lips of the wound from each other, and having separated the artery from its venæ comites, pass the needle around it, from within outwards, to avoid the nerve, which in this situation lies to the inner or tibial side of the artery.

PERONEAL ARTERY.

Place the leg in the extended position, and make an incision five inches in length through the skin and superficial fascia, commencing at the external margin of the tendo Achillis where it corresponds to the external malleolus, and continuing it obliquely upwards to the outer margin of the fibula. Next divide the deep fascia to the same extent, and the attachment of the flexor pollicis proprius muscle to the fibula will be exposed : by detaching this muscle from the fibula for three inches, or by drawing its inner free edge outwards, the artery will be found resting upon the interosseous ligament. The needle is to be carried around the vessel from within outwards.

POPLITEAL ARTERY,

As it lies between the heads of the gastrocnemius muscle, or at the inferior third of the popliteal space.

Lay the patient upon the abdomen, and extend the leg; make an incision downwards and a little outwards, from the centre of the popliteal space, for four inches, dividing the skin and superficial fascia, and avoiding the lesser saphena vein, and its accompanying nerve, which must be drawn to either side of the wound. Now flex the leg, and tear through some fat and cellular tissue, when the posterior tibial nerve will be exposed, which must be drawn inwards: by still cautiously pursuing the dissection, the artery and vein will be brought into view in close connection with each other. The vein is to be separated from the artery and drawn to the outer side, and the needle passed around the vessel from without inwards.*

POPLITEAL ARTERY,

In the upper third of the popliteal space.

Place the patient as recommended in the last operation, and commence an incision at the upper

* In this operation the arteriæ surales are liable to be wounded, and if so, they should be immediately secured.

part of the popliteal space, taking as a guide the external margin of the semimembranosus muscle, and continue it downwards for three or four inches. Divide the fascia lata to the same extent, and draw inwards the edge of the semimembranosus muscle. The artery and vein will now be found; the vein lying anterior and rather external to the artery, and in intimate connection with it. Flex the leg, cautiously separate the vessels from each other for a few lines, and pass the needle around the artery from without inwards. The posterior crural nerve lies superficial, and to the outer side of the vessels, and is not endangered in this operation; if it should be exposed, it must be drawn to the outer side of wound.*

FEMORAL ARTERY,

In the middle third of the thigh.

Place the patient in the horizontal posture; semi-flex the thigh upon the pelvis, and rotate the limb outwards, which will, in general, render evident the course of the sartorius muscle, along the inner

* The popliteal vein might, in either of these operations, be readily mistaken for the artery, in consequence of the great thickness of its coats and the intimate union existing between the two vessels: hence it should be borne in mind, that the vein is superficial to the artery, and rather external to it.

edge of which an incision four inches in length is to be made, corresponding to the middle third of the thigh. If the course of the sartorius be not well marked, the central third of a line drawn from the centre of Poupart's ligament to the inner edge of the patella will nearly correspond to the course of the artery in this situation. In dividing the skin in this incision, the internal saphena vein is in great danger of being wounded, unless its course be ascertained before commencing the operation, which can be done by making compression above it. Protecting this vein, the operation is to be proceeded with by dividing the superficial fascia and the fascia lata for the same extent as the external incision; when the sartorius muscle will be brought into view. The inner edge of this muscle is to be drawn outwards, and the strong fascia lying immediately beneath it, which passes from the vastus internus to the adductor magnus, and which crosses the femoral vessels, is to be cautiously divided upon a director, when the sheath will be exposed; this being opened, the saphenus nerve will be found lying anterior and external to the artery, and the vein posterior to the vessel. Separate the artery from the vein and nerve, and pass the needle around it from within outwards.

FEMORAL ARTERY,

In the upper third of the thigh.

Place the patient in the horizontal posture, with the limb slightly bent upon the pelvis, and rotated outwards. Make an incision commencing an inch below Poupart's ligament, and corresponding to its centre, downwards and inwards, to the extent of four inches. The internal saphena vein will be found to run internal to this incision. Having cut through the skin and superficial fascia, divide upon a director the fascia lata; when the edge of the sartorius muscle will be seen, and must be retracted outwards; and then, by carefully cutting through, upon a director, some cellular tissue, the sheath of the vessels will be seen, which is to be opened for the extent of an inch, and the needle passed around the vessel from within outwards, with a view to the protection of the femoral vein.*

* The direction here given for passing the needle is that universally adopted in operating upon the dead subject, and recommended in all works upon operative surgery: I have, however, witnessed two cases of this operation for popliteal aneurism, in which the needle was passed around the artery from without inwards. In one, it was found impossible to insinuate the point of the needle between the artery and the vein; in the other, the femoral vein was wounded in attempting to do so; yet in both those cases the needle was readily passed in the contrary direction.— Both operations were successful.

EXTERNAL ILIAC ARTERY.

Mr. Abernethy and Sir Astley Cooper have recommended different methods for securing this artery, by either of which it can be easily got at. In Mr. Abernethy's operation, greater injury is inflicted upon the abdominal parietes than in that of Sir Astley Cooper, but it possesses the advantage of enabling us to follow up the artery to its very origin.

1.

Operation after Mr. Abernethy's Method.

Place the patient upon a table in the horizontal posture, and make an incision from three to four inches in length through the integuments of the abdomen, beginning a little above Poupart's ligament, and about an inch and a half from the anterior superior spine of the ilium towards the linea alba, and nearly an inch on the outside of the external abdominal ring. The aponeurosis of the external oblique muscle, being thus exposed, is to be divided to the extent of the external wound, and the finger of the operator is to be introduced underneath the inferior margin of the internal oblique and transversalis muscles, which are to be divided

with a probe-pointed bistoury for about one inch and a half: the finger is then to be passed beneath the peritoneum, which is to be carried upon it upwards and inwards by the side of the psoas muscle; when the artery can be felt. The external iliac vein is situated upon the inner side of the artery, and the anterior crural nerve runs externally, covered by the fascia iliaca, and separated from the vessel by the psoas muscle. The layer of the fascia iliaca which forms the fascia propria of a femoral hernia, and which binds down the artery, is to be torn through, and the needle passed around the vessel from within outwards.

2.

Operation after Sir Astley Cooper's Method.

Make an incision, in the direction of the fibres of the aponeurosis of the external oblique muscle, through the integuments; one extremity of which must be situated near the spine of the ilium, the other a little above the inner margin of the abdominal ring, by which the aponeurosis will be exposed. This is next to be divided for the entire extent, and in the direction of the external wound: the flap thus formed being raised, the spermatic cord will be seen passing under the margin of the external oblique and transversalis muscles. The opening in the fascia which lines the transversalis muscle, and

through which the spermatic cord passes, is situated midway between the anterior superior spine of the ilium and the symphysis pubis. The epigastric artery runs precisely along the inner margin of this opening, beneath which the external iliac artery will be found. If the finger is passed under the spermatic cord, through this opening in the fascia which lines the transversalis muscle, it will come into immediate contact with the artery, which lies on the outside of the iliac vein. The artery and vein are connected together by dense cellular membrane, which must be separated to enable the operator to pass a ligature.

INTERNAL ILIAC ARTERY.

Place the patient in the same position as for tying the external iliac artery, and commence an incision, midway between the anterior superior spinous process of the ilium and the symphysis pubis, at Poupart's ligament, extending upwards and a little outwards for about four inches; divide the three layers of the abdominal muscles, either upon the finger or a director, and cautiously tear through the transversalis fascia. The peritoneum, being thus brought into view, is to be raised gently from the subjacent parts; and the external iliac artery, being ascertained, is to be followed up to the termination of the common iliac. The internal iliac can now

easily be got at as it is descending into the pelvis, and having separated it from its connections, pass the needle around the vessel from within outwards.

PRIMITIVE ILIAC ARTERY.

Make an incision from five to six inches in length, commencing above the external abdominal ring, and carrying it upwards and outwards a little beyond the anterior superior spine of the ilium; next divide the three abdominal muscles to the same extent, and, lastly, the fascia transversalis. The peritoneum must now be cautiously removed from the iliac muscle, and the external iliac artery followed to the common iliac. The artery is to be separated with the finger-nail from the vein, and the needle passed around the vessel from within outwards.*

THE AORTA.

Sir Astley Cooper secured this artery in a case of aneurism of the external iliac artery. An incision three inches in length was made into the linea alba, with a curve to avoid the umbilicus;

* Dr. Mott, of Philadelphia, has secured this artery with success, in a case of iliac aneurism.

having penetrated the abdominal cavity, the fingers of the operator were passed between the convolutions of the intestines and the artery was recognised by its pulsations. The peritoneum was next lacerated, and a ligature was passed around the vessel.— The patient lived forty hours after the operation.

The operation which has been described for securing the primitive iliac artery, will also allow the operator to follow up this vessel to the aorta, and enable him to pass a ligature around the latter.

Amongst the few instruments recommended for the performance of the foregoing operations, a director is often made mention of. Mr. Liston, however, assures me he never uses this instrument.

In such hands a director might afford but little assistance; but in the hands of others, whose opportunities of operating have not been so numerous, I question the propriety of dispensing with it.

THE END.

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